

METROPOLITAN WASHINGTON AIRPORTS AUTHORITY



June 21, 2013

Ms. Susan Mackert  
Environmental Specialist II Senior  
Virginia Department of Environmental Quality  
13901 Crown Court  
Woodbridge, VA 22193

RE: Annual Report - Virginia Pollutant Discharge Elimination System (VPDES)  
Permit No. VA0089541

Dear Ms. Mackert:

Enclosed is the Annual Report for the period May 1, 2012, through April 30, 2013, as required by the Washington Dulles International Airport VPDES Permit. The report contains information required from the current permit.

If you have questions concerning the information submitted to your office, please contact Mr. Jon Byroade or Ms. Jennell Lowry of my staff on (703) 572-2800.

Sincerely,

Brian A. Leuck, P.E.  
Manager, Engineering and Maintenance Dept.

BAL:sa

Enclosures

Entered 6/21/13  
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METROPOLITAN WASHINGTON  
AIRPORTS AUTHORITY



**WASHINGTON DULLES INTERNATIONAL AIRPORT**

**VPDES PERMIT VA 0089541**

**2012-2013 ANNUAL REPORT**





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## EXECUTIVE SUMMARY

This is the fourteenth annual report submitted under Virginia Pollutant Discharge Elimination System (VPDES) Permit No. VA0089541 for Washington Dulles International Airport. The permit was re-issued on July 27, 2009, and expires on July 26, 2014. The Metropolitan Washington Airports Authority (Airports Authority) has prepared this report for the period of May 1, 2012 through April 30, 2013.

Dulles encompasses almost 13,000 acres within the Middle Potomac River Sub Basin to the north and the Occoquan River Sub Basin to the south. The drainage divide meanders in an east-southeasterly direction that generally parallels Runway 12-30 located on the southern portion of the divide. The northern drainage area contributes stormwater runoff to the Horsepen Run-Broad Run watershed and the southern drainage area contributes to the Cub Run watershed.

The Airport continues to add features to improve its ability to treat and eliminate the discharge of water pollutants due to deicing operations and on-going and new construction activities.

### 1. STATUS OF SPPP IMPLEMENTATION FOR INDUSTRIAL ACTIVITIES

The Stormwater Pollution Prevention Plan (SPPP) was updated in June 2008 and a complete certified copy of the revised SPPP was submitted on June 19, 2008 to the Department of Environmental Quality (DEQ) as part of the Airports Authority's permit renewal application. All components of the existing SPPP have been implemented.

#### A. EFFECTIVENESS OF CONTROLS

##### **Good Housekeeping**

Good housekeeping practices are designed to maintain a clean and orderly work environment, which reduces the possibility of accidental spills caused by mishandling of chemicals and equipment. Good housekeeping practices are generally the most effective measures to prevent stormwater runoff contamination from areas engaged in industrial activities. The Airports Authority's good housekeeping practices include the following components:

- ➔ **Routine Clean-up Operations** - Includes maintaining clean, dry ground surfaces and the regular collection and disposal of trash and waste material.
- ➔ **Careful Material Storage** - Storing containers away from direct traffic routes to prevent accidental spills and damage to containers; storing containers in covered areas in secondary containment to eliminate any exposure to stormwater, prevent corrosion, and to contain spills, leaks, and drippage; and segregating incompatible materials.
- ➔ **Material Inventory** - Procedures include maintaining an inventory of materials that may be exposed to precipitation. The inventory includes the material narrative, storage location, disposal method, practices employed to minimize contact with stormwater runoff, structural and non-structural Best Management Practices (BMPs) locations and a description of any treatment the stormwater receives.



## Source Reduction

Since 1998, the Airports Authority has had a voluntary ban on using ethylene glycol for aircraft deicing. As a special condition to the current permit, its use is prohibited. The Airports Authority banned the use of urea-based products on the Airport to reduce potential impacts to receiving waters. The Airport also monitors pavement surfaces and weather conditions to use the minimal effective amount of roadway and runway deicing materials to maintain airline and public safety.

## Preventative Maintenance

Preventative maintenance includes the regular inspection and maintenance of not only stormwater BMPs, but also equipment and systems that can affect stormwater quality. Preventative maintenance measures implemented are as follows:

- **Proper Maintenance of Equipment** - The Airports Authority conducts inspections, testing, and when necessary, repairs of equipment, including oil/water separators, water quality structures, and other stormwater management equipment and structures, such as drain plugs and glycol recovery vehicles (GRVs), on a regular basis. This allows detection of leaks or other defects that could cause breakdowns or failures that could result in discharges of pollutants to stormwater.
- **Aboveground Storage Tanks (ASTs)** - The Authority's 27 ASTs used for oil products have a total storage capacity of 92,350 gallons. Nine of the ASTs have a capacity of over 660 gallons and are registered with DEQ. All ASTs at Dulles either are double-walled tanks or are located within secondary containment. Section 9 VAC 25-91-170 requires weekly inspections of AST facilities with greater than 25,000 gallons, single or aggregate capacity. It is required by Section 9 VAC 25-91-130 that a daily visual inspection be conducted each day of the ASTs greater than 660 gallons of oil. The visual inspections include:
  - A complete walk through to ensure no hazardous conditions exist
  - Inspection of ground surface for signs of leakage, spillage, or stained or discolored soils
  - A check of the berm or dike area for excessive accumulation of water and to ensure the dike or berm valves are secured,
  - A visual inspection of the exterior tank shell for signs of leakage or damage
  - An evaluation of the condition of the tank and appurtenances

Weekly inspections are also conducted on ASTs larger than 660 gallons to check for leaks, damage, and equipment malfunction. Monthly inspections are conducted on all ASTs to check for leaks, damage, and equipment malfunction. Any discrepancies noted during the daily, weekly, and monthly inspections of the ASTs are corrected promptly after they have been identified. All inspection findings are documented by use of checklists.

## Spill Prevention and Response Procedures

Airport employees and tenants are instructed to report spills to the Airports Authority immediately and submit a spill report form. A Hard Copy or an Electronic Copy of all reports and a database of all spill notifications and any corrective action(s) are maintained by the Government Programs Engineers. Detailed spill response procedures are found in Appendices A and B of the Comprehensive Pollution Prevention Plan (CPPP) (2008 revision), and the Stormwater Sewer Operations and Maintenance Manual, submitted to DEQ in October 2009.



To reduce the risk of an accidental discharge of regulated substances (i.e., hazardous substance or petroleum products) into the sanitary sewer system, storm sewer system, or to the environment, Standard Operating Procedures (SOPs) have been established for the storage and handling of these materials. These SOPs are issued to all Airports Authority and tenant operators. These standards seek to minimize the probability of an accidental spill from equipment failures and human error, should one occur, and reduce the risk of entering the sewer or the environment. Detailed SOPs are found in Appendix C of the CPPP, and include the following activities:

- ➔ Storage of Regulated Substances
- ➔ Bulk Transfer of Regulated Substances
- ➔ Draining Secondary Containment Contents
- ➔ Handling Drums and Small Containers Containing Regulated Substances

### **Employee Training**

The Airports Authority conducts employee training that includes annual environmental awareness and multi-media pollution prevention training. Spill response, hazardous communication, good housekeeping, hazardous waste handling, and material management practices are covered in this training.

### **Management of Runoff**

During the past winter season, glycol levels at the Horsepen Lake discharge never exceeded the maximum concentration goal of 100 mg/L.

During this past season, 18 glycol recovery vehicles (GRVs) were available. Depending on storm type and expected precipitation amount, the glycol recovery contractor would have a predetermined number of GRVs ready to operate with the ability to mobilize more if needed. Prior to a storm, sluice gates or drain valves would be closed to prevent drainage from deicing fluid application areas or if no sluice gate was available, an inflatable drain plug was inserted. The areas designated for centralized deicing were used to the maximum extent possible.

Compared to the previous deicing season, the propylene glycol concentrations at the Horsepen Lake outfall increased slightly, with only one day spent above 20 mg/L. This past season, the maximum propylene glycol concentration was 39.3 mg/L, obtained via field sampling on March 26. During the 2011-2012 season, the maximum propylene glycol concentration at the Horsepen Lake outfall was 15.0 mg/L. The propylene glycol concentrations exceeded the goal for zero days in the 2011-2012 season; similarly, the goal was never exceeded this past season.

See Appendix A for complete glycol use and recovery data tables.

## **B. SITE MAP AND OUTFALL LOCATIONS**

Most runoff from impervious areas drains north to Broad Run through Horsepen Lake. However, as the Airport continues to expand, some of the additional runoff drains south to Cub Run. The Airport property straddles the Loudoun County – Fairfax County line, with most of the Airport located in Loudoun County. The property is divided into 11 storm drainage areas with discreet surface water discharge points that service over 6,000 acres under operation or construction.

The majority of the industrial activities at the Airport are located within the Horsepen Run watershed. The main branch of Horsepen Run receives runoff from the northeastern quadrant of the Airport before discharging into Horsepen Lake located at the north end of the Airport property. The other



major feeder stream from the operational portion of the Airport to Horsepen Lake is Stallion Branch, which runs between the new fourth Runway 1L/19R and Runway 1C/19C. Stallion Branch joins Horsepen Run just upstream of Horsepen Lake. Stallion Branch receives runoff from the majority of aircraft deicing, fueling, and maintenance areas at the Airport.

The Cub Run watershed receives runoff from an unnamed tributary that drains Runway 12/30, the Airports Authority southern shops and maintenance facilities, and the southern portion of Taxiway J to Runway 1R/19L. Another major contributor to Cub Run is Dead Run, which originates just to the south of Runway 1R/19L and drains the southern end of the runway. A third major contributor to Cub Run is Sand Run, which drains runoff from the fire training facility located near the southern property boundary of the Airport.

Under VPDES Permit No. 0089541, with an effective date of July 27, 2009, the Airports Authority is now required to monitor 32 outfalls and 3 in-stream locations for various parameters at different frequencies. The Airports Authority is also required to submit an annual report to the Virginia Department of Environmental Quality (DEQ) by June 30 of each permit year. Stormwater sampling data is recorded for Discharge Monitoring Reports (DMRs) and electronically submitted through DEQ's e-DMR website.

The Airports Authority uses an environmental consultant and an accredited laboratory to perform the field monitoring and laboratory analysis. The following samples are collected and analyzed to meet permit requirements:

- ➔ Four outfalls are monitored monthly for flow, pH, BOD<sub>5</sub>, COD, TSS, TPH, TKN, dissolved oxygen, conductivity, and propylene glycol once per deicing event.
- ➔ Four outfalls are monitored monthly for flow, pH, TPH, and TSS.
- ➔ 22 outfalls are monitored quarterly for flow, pH, BOD<sub>5</sub>, COD, TSS, TPH, TKN, propylene glycol, dissolved oxygen, and conductivity. Fifteen of these outfalls can be represented by another outfall.
- ➔ Two outfalls are monitored annually for flow, pH, TPH, and TSS.
- ➔ In-stream samples are collected monthly from Rt. 606 and Cub Run for flow, pH, TPH, TSS, BOD<sub>5</sub>, COD, TKN, dissolved oxygen, conductivity, and propylene glycol once per deicing event.
- ➔ In-stream sample are collected monthly from the unnamed stream by Landmark Aviation and the Cargo Ramps for flow, pH, TPH, TSS, BOD<sub>5</sub>, COD, TKN, propylene glycol, dissolved oxygen, and conductivity.

The environmental consultant prepares and submits a monthly report of the monitoring activity that includes copies of laboratory analyses, field notes, and report of visual findings. They also provide by June 1 of each year the Airports Authority a summary of annual monitoring data from May (in the previous year) through April (in the current year) for inclusion to the annual report to DEQ. The figure in Appendix C illustrates the location and monitoring frequency of each outfall.

### **C. SPILLS AND LEAKS**

The Airports Authority's Fire Department has its own hazardous materials (HAZMAT) response team that is housed at the Airport. They respond to all fuel and other spills on the airport. Their activities include emergency response and containment of spills. Once contained, the spiller (either tenant or the Airports Authority) is the responsible parties for cleanup and DEQ notification, if required. All spills from May 2012 to April 2013 were reported and tracked as part of the Airport Authority's VPDES permit, and a log is included as Appendix B of this report.



#### **D. COMPREHENSIVE SITE COMPLIANCE EVALUATION**

The Airports Authority conducted a Comprehensive Site Compliance Evaluation (CSCE) in Fall 2012 as required. No deficiencies were found with the current Stormwater Pollution Prevention Plan (SPPP), thus no modification were made.

#### **E. SUMMARY OF PLANNED STORMWATER ACTIVITIES**

The Airports Authority has completed a project called Glycol Runoff Enhancements, which will aid in the collection of aircraft deicing fluid run-off. This project included the installation of a low flow weir and modifications of two existing manhole structures.

#### **F. CHANGES TO SPPP DURING THE REPORTING PERIOD**

In conjunction with the deicing fluid management program, current improvements included the inspection and replacement of ineffective drain plugs throughout the Airport. This allows any runoff that occurs during a deicing event at the ramp area to be collected in the storm drains and removed. This further decreases the amount of deicing fluid leaving the Airport. All these procedures are fully described in the Deicing Management and Monitoring Plan (DMMP) that was developed under the permit issued in 2009 and submitted to VDEQ for review/approval in January 2010.

Remote deicing on the Runway 12/30 Run-up Block was performed in past seasons to meet the increased operations from regional jets. During the 2009-2010 season, changes were made so that both wide-body and narrow-body aircraft could use the 12/30 Run-up Block for deicing operations. This past season, the 12/30 Run-up Block was used effectively for both wide-bodied and narrow-bodied aircraft during all snowstorms with estimated accumulation one inch or greater and any ice/freezing rain event. The airport continues to work with Airport Operations and the Airlines to better use the Runway 12/30 Run-Up Block and obtain better notification of daily deicing plans from the airlines.

Remote deicing continues to be conducted at the R gate parking area north of Taxiway F. New aircraft lead-in lines were painted to accommodate deicing activities for regional aircraft. The trench drains and gate valves in this location allowed it to be used as a centralized deicing area.

Deicing Apron W, located between Runway 1C-19C and 1L-19R, continued to be used this past season. This deicing pad was designed and constructed with valves, trench drains and an underground vault to aid in the collection of spent deicing fluids and further reduce glycol discharges from the Airport.

The Airports Authority developed guidelines with the Federal Aviation Administration (FAA) to facilitate the usage of this pad for storm events. The Airports Authority will continue to expand infrastructure to maximize use of this pad in the future deicing seasons.

In addition to the required permit sampling, Airports Authority staff collected data with a portable microprocessor-based LED water analyzer at numerous outfalls on the Airport to identify the highest concentrations of glycol runoff and better predict the glycol concentrations that might be discharged from the Airport property. Airports Authority staff also verified that the closed/blocked drains were functioning properly. Drain plugs that were not functioning adequately were adjusted or replaced prior to the next storm event.

The figure in Appendix A shows the approved aircraft deicing application areas (i.e., Areas 1 – 7, FBOs, and Cargo Ramp) that were used in the past and may be used in the future. No other areas were



allowed for applying aircraft deicing fluid, unless they were approved by Airport Operations with appropriate notification to the Glycol Recovery Contractor. The areas used this season are presented below:

- ➔ **Area 1** - Deicing operations for aircraft on the Z Gates occurred on the gates. A trench drain at the rear of the aircraft was closed and the glycol runoff was captured or recovered by GRVs and transported to the storage tanks.
- ➔ **Area 2** - Deicing operations for the north side of Concourse B occurred on the gate. The majority of this ramp was set up with drains that blocked glycol from entering the storm system. GRVs recovered spent glycol after aircraft pushed back from the gate. The GRVs collected all spent glycol in the locations that did not contain drains.
- ➔ **Area 3** - Deicing operations on the south side of Concourse B occurred on the gate. The majority of the ramp was set up with drains that blocked glycol from entering the storm system. GRVs recovered spent glycol after aircraft pushed back from the gate. The GRVs collected all spent glycol in the locations that did not contain drains.
- ➔ **Area 4** - No centralized deicing occurred on Taxiway D. On-gate deicing on the north side of Concourse C/D did occur and GRVs recovered spent glycol after aircraft pushed back. This area was restricted to deicing for frost and minor storm events, but some wide-body and narrow-body aircraft deicing may occur in major events for operational reasons.
- ➔ **Area 5** - Deicing on the south side of Concourse C/D was also restricted to on-gate deicing only for frost and minor storm events, but limited wide-body and narrow-body aircraft deicing did occur in major events for operational reasons.
- ➔ **Area 6** - The northern R gates along Taxiway F were used as centralized deicing pad and were marked to accommodate small regional planes. United Express used this pad during any possible storm and several frost events.
- ➔ **Area 7** - The 12/30 run-up block was used by United Air Lines this season. This location is marked to accommodate both wide-bodied and narrow-bodied aircraft.
- ➔ **Area 8** - The express gates of Concourse A are restricted to on-gate deicing for frost events only.
- ➔ **Centralized Deicing Apron W** - This pad was used by Swissport.
- ➔ **Cargo Area 1** - This area was used by the Cargo Operators and occasionally by the FBOs. Deicing occurred on the gate and ramp area after notification to Airport Operations and the Glycol Recovery Contractor.
- ➔ **Cargo Area 2** - Cargo Operators used this area infrequently due to only one operator in this area during the past season. Deicing occurred on the gate and ramp area after notification to the Glycol Recovery Contractor.
- ➔ **North FBO Operations** (currently operated by Landmark Aviation) - This area was used by the FBO after notification to Airport Operations and the Glycol Recovery Contractor.
- ➔ **East FBO Operations** (currently operated by Signature Flight Services and the Dulles Jet Center) - No drains exist on the concrete ramp so all recovery was performed by GRVs after notification to the Glycol Recovery Contractor.



## **G. PROPOSED CHANGES TO SPPP and DMMP**

At this time, due to operational and financial reasons, the Airports Authority does not foresee any major changes to the SPPP or the DMMP.

### **2. ANNUAL PROPYLENE GLYCOL LOAD**

A comprehensive deicing study had been conducted in 2002 and it was determined that the best long-term management program includes continued limited at-gate deicing and use of centralized deicing pads, and various storage, disposal, treatment, and recycling options. The first use of a deicing pad began in the fall of 2004 at the Runway 12/30 Hold Block.

An improved aircraft deicing fluid management program was implemented for the 1999-2000 deicing season and continued into the past season. To reduce the pollutant loadings to the stormwater system from aircraft deicing fluid, the Airports Authority has issued contracts to recover glycol-contaminated runoff from the ramp areas. Recovered water with a glycol concentration of three percent or greater is stored for recycling. Recovered water with glycol concentrations of less than three percent is stored in a 350,000-gallon aboveground holding tank equipped with a floating aeration system.

After treatment, the effluent from the filtration system is discharged to the sanitary sewer at approximately 90 gallons per minute (gpm). Sanitary disposal of recovered water with glycol concentrations of less than five percent is included in the District of Columbia Water and Sewer Authority (WASA) permit (Permit Number 025-7, issued December 1, 2009) to discharge to the Blue Plains Wastewater Treatment Plant under special condition.

The goal of the glycol recovery program is to capture as much glycol at its point of application to reduce the pollutant loadings down stream. The minimum requirements for the recovery program require the use of drain plugs in most locations throughout the Airport and the removal of the collected runoff by use of vacuum trucks. The contract also requires the contractor to provide GRVs to remove the glycol from the paved areas during frost and storm events. To help reduce glycol from entering the drains near deicing locations, over 90 drain plugs or inserts were installed and closed to facilitate recovery operations. The Airports Authority also works with the snow removal contractor to separate snow with glycol (i.e., pink snow) from snow without glycol before it is melted. The impacted snow is segregated at a specific location where the glycol can be captured as it leaches from the snow.

Pavement deicing operations on the airport make use of potassium acetate liquid and sodium acetate and sodium formate solids for deicing and anti-icing operations.

The estimate for the annual pollutant loading resulting from deicing compounds is based on deicing fluid quantities dispensed and amount recovered. The quantity of propylene glycol used during the winter season is dependent on various factors including temperature, storm intensity and duration, and aircraft operations.

During the past winter season, two deicing events occurred with 12.7 inches of snow at Dulles Airport during the 2012-2013 winter season, 7.4 inches of snow fell in March 2013. The first deicing event occurred on March 5-6, 2013 with a total of 3.3 inches of snow. Many of the domestic flights into and out of Dulles Airport were cancelled; however, the international carriers still continued in a normal operation schedule. The second deicing event occurred on March 25, 2013 with a total of 3.2 inches of snow. Unlike the deicing event that occurred in early March, during this event airline operations remained close to the normal.



A total of 214,789 gallons of Type I and Type IV were applied during the 2012-2013 Winter Season. The total snowfall amount was 12.7 inches. The airlines/deicing companies applied 180,695 gallons of Type I deicing fluid (70,694 gallons of normalized Type I) and 34,094 gallons of Type IV deicing fluid (17,247 gallons of normalized Type IV) during the winter season. Normalized Type I or Type IV is the aircraft deicing fluid less any water added by the manufacture or customer before ADF application. Thus, the total amount of 87,941 gallons of 100% propylene glycol was applied. The month of March had the most applied deicing fluid; a total of 59,375 gallons of deicing fluid was applied (24,714 @ 100% propylene glycol), with the majority of that glycol applied on March 25 when light snow, heavy at times, changed over to rain.

This season, all airlines and deicing companies were required to obtain an Aircraft Deicing Authorization (ADA) before they could perform deicing activities at the Airport. The ADA provided the Airports Authority with the deicing procedures and a copy of the Material Safety Data Sheet (MSDS) and mixing procedures for the deicing fluids used by each of the airlines and deicing companies. A complete list of airlines/deicing companies, the amount of glycol applied monthly, and the propylene glycol percentage in the Type I and Type IV fluid can be found in Appendix A.

The Glycol Recovery Contractor collected 635,810 gallons at an average concentration of 8.90%, which is equivalent to recovering 56,613 gallons of 100% propylene glycol.

Of the 87,941 gallons of the 100% propylene glycol applied, only 75 percent of the normalized Type I ADF and 10 percent of the normalized Type IV ADF is available for recovery. Thus, only 54,746 gallons was available for recovery. The Glycol Recovery Contractor was able to collect 100% of what was available for recovery (64.4% of the total 100% propylene glycol applied). Therefore, for the 2012-2013 deicing season only a minimal amount of the 87,941 gallons applied had the potential to enter the storm drain system.

The chart below shows the summary of ADF usage and recovery over the past four seasons:

Season	Type I Applied	Type IV Applied	100% Glycol Applied	Glycol Recovered (100% Glycol)	Glycol Recovery Percentage
2012-2013	180,695	34,094	87,941	56,613	100%
2011-2012	186,841	31,992	94,354	32,310	53.6%
2010-2011	416,700	35,482	196,723	97,455	49.5%
2009-2010	596,389	65,124	282,671	123,645	43.7%

### 3. REVIEW OF NEW AIRCRAFT AND PAVEMENT DEICING/ANTI-ICING PRODUCTS

With regard to pavement deicing, the Airports Authority used a mixture of Cryotech EX180 and E36 for liquid application. Cryotech EX180 is a combination of corn-derived propanediol and sodium and potassium acetate. We will continue to investigate and use liquid products, as they become available to find the most effective combinations to satisfy runway friction requirements and minimize environmental impacts. The Airports Authority used Cryotech's NAAC for solid application.

### 4. EVALUATION OF TOC AS MEASURE OF PROPYLENE GLYCOL

In March 2010, the Airports Authority installed a Total Organic Carbon (TOC) On-line Monitor at SS001 (Horsepen Lake Outfall) as required by the VPDES Permit. In September 2010, the TOC Monitor was replaced due to continuous malfunctions.

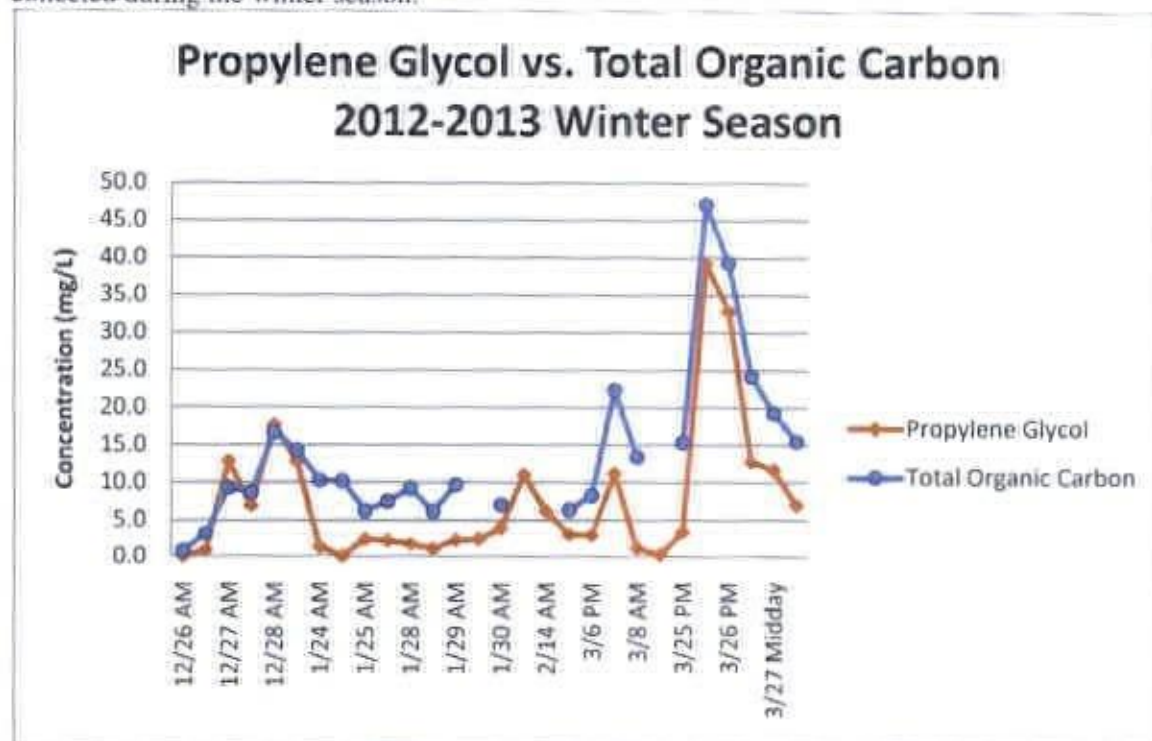


In previous winter seasons, an approximate 1:1 correlation of TOC to propylene glycol was established through the data collected. However, this correlation did not apply when glycol concentrations are below five milligrams per liter (mg/L).

During this past season, data was collected to determine if the 1:1 ratio remained. However, this season no clear ratio was apparent. During some sampling periods, a 1:1 ratio was seen; however, other sampling periods revealed more of a 2:1 ratio for TOC to propylene glycol. The overall ratio for the 2012-2013 winter season was found to be 1:¾ correlation of TOC to propylene glycol. We will continue in the coming seasons to monitor the relationship between TOC and propylene glycol.

## 5. TOC MONITORING DATA REVIEW

As required by the VPDES Permit, the Airports Authority began collecting data from the On-line TOC Monitor during this past season. Overall, the TOC Monitor operated within specifications throughout the winter season. The chart below shows the concentrations of propylene glycol and TOC collected during the winter season.



## 6. MONITORING DATA FOR RUNWAY 4 DISCHARGE SPECIAL STUDY

The storm water permit, issued July 2009, requires monitoring of the storm water runoff at both the entry point and discharge point of each Biological Treatment Unit (BTU) upon proper establishment. These samples are to be collected for a minimum of two deicing and/or anti-icing events where Centralized Deicing Apron W is used. Two deicing events occurred during the past season; however, the BTUs were not sampled for either event. The March 5-6 deicing event was not sampled because very little flow occurred at the BTUs until after the event. The March 25 deicing event was a surprise, the inconsistent forecasts did not allow adequate time to prepare the auto-samplers.



## 7. SUMMARY OF ALL OUTFALL MONITORING DATA

The data below is an annual summary of all outfalls and stream samples collected from May 2012 to April 2013. The outfalls and stream samples are grouped in accordance to the sections in the storm water permit. All sampling data and visual monitoring data collected throughout the reporting year can be found in Appendix D.

### 1. Outfalls 001, 002, and 003

All samples were collected and analyzed in accordance with the permit requirements. There are no limits on any of the parameters for these outfalls. Samples were collected once a month. All parameters were sampled for OF001, OF002, and OF003 for all twelve months; however, for OF001 only eight of the twelve samples collected were representative due to no flow. The chart below shows the average value of each parameter collected.

	OF001	OF002	OF003
<i>Flow (MGD)</i>	3.15	0.19	1.88
<i>pH</i>	8.19	8.72	7.47
<i>Dissolved Oxygen</i>	6.04	6.61	6.86
<i>Conductivity</i>	292.25	396.08	442.33
<i>TPH-DRO</i>	0.18	0.15	0.16
<i>Total Kjeldahl Nitrogen</i>	0.26	0.86	0.40
<i>BOD (5-Day)</i>	16.75	42.70	100.04
<i>COD</i>	26.88	136.39	199.42
<i>Total Suspended Solids</i>	5.38	66.88	4.48

During the October through April 2013 period, two deicing events occurred. The chart below shows the average results for propylene glycol concentration in mg/L.

OF001	OF002	OF003
119.5	64.5	196.5

## 2. Outfalls 004, 005, and 006

All samples were collected and analyzed in accordance with the permit requirements. The permit allows for the discharge data from Outfall 005 to be submitted as representative of Outfalls 004 and Outfall 006. There are no limits on any of the parameters for these outfalls. Samples for OF005 were collected for each of the four quarters; however, only two samples were collected when the outfall had a discharge. The average flow was 1.62MGD. The chart below shows the average value for each parameter.

	<i>pH</i>	<i>DO</i>	<i>Conductivity</i>	<i>Propylene Glycol</i>	<i>TPH-DRO</i>	<i>TKN</i>	<i>BOD (5 Day)</i>	<i>COD</i>	<i>TSS</i>
OF005	7.41	8.25	237.00	<5.0	0.11	1.05	5.40	38.05	3.40

## 3. Outfalls 007, 008, 009, 010, 011, 012, 013, 014, 015, and 016

All samples were collected and analyzed in accordance with the permit requirements. The permit allows for discharge data from Outfall 015 to be submitted as representative of Outfalls 007, 008, 009, 010, 011, 012, 013, 014, and 016. There are no limits on any of the parameters for these outfalls. All parameters were sampled for each four quarters for OF015. Representative samples were collected for all four quarters. For OF015, the average flow was 9.87 MGD. The chart below shows the average value for each parameter.

	<i>pH</i>	<i>DO</i>	<i>Conductivity</i>	<i>Propylene Glycol</i>	<i>TPH-DRO</i>	<i>TKN</i>	<i>BOD (5 Day)</i>	<i>COD</i>	<i>TSS</i>
OF015	7.52	7.08	270.75	<5.0	0.16	0.32	13.33	35.20	3.63

## 4. Outfall 017

The current Outfall 017 has been destroyed for the construction of the new United Hanger. Once construction is complete, the Airports Authority will evaluate the site for a sampling point downstream of the original.

## 5. Outfall 018

All samples were collected and analyzed in accordance with the permit requirements. There are no limits on any of the parameters for this outfall. There is no representative data available for OF018, due to no flow when the annual sample was collected.

## 6. Outfall 019

All samples were collected quarterly and analyzed in accordance with the permit requirements. There are no limits on any of the parameters for this outfall. Representative samples were collected for three of the four quarters. For OF019, the average flow was 1.25 MGD. The chart below shows the average value for each parameter.

	<i>pH</i>	<i>DO</i>	<i>Conductivity</i>	<i>Propylene Glycol</i>	<i>TPH-DRO</i>	<i>TKN</i>	<i>BOD (5 Day)</i>	<i>COD</i>	<i>TSS</i>
OF019	8.03	6.83	286.67	<5.0	<0.1	0.45	<5.0	20.63	5.83



## 7. Outfall 020 and 021

All samples were collected and analyzed in accordance with the permit requirements. These outfalls have limits that include a pH value within 6.0 and 9.0 SU, a monthly average for TPH of 15 mg/L and a daily maximum of 30 mg/L. None of these limits were violated during the May 2012 through April 2013 sampling period. Samples for OF020 were collected all twelve months; all samples collected were during a discharge and are representative. Samples for OF021 were collected for all twelve months; however, only five of those samples were collected during a discharge. The chart below shows the average value of each parameter collected.

	OF020	OF021
<i>Flow</i>	1.60	0.19
<i>pH</i>	7.87	7.91
<i>TPH-DRO</i>	<0.1	<0.1
<i>Total Suspended Solids</i>	3.82	13.04

## 8. Outfalls 022, 023, and 024

All samples were collected and analyzed in accordance with the permit requirements. The permit allows for discharge data from Outfall 022 to be submitted to represent Outfalls 023 and 024. There are no limits on any of the parameters for these outfalls. Samples for OF022 were collected for each of the four quarters; however, only two samples were collected when the outfall had a discharge. The average flow for OF022 was 3.64 MGD. For the representative samples collected, the average value for each parameter is shown in the chart below.

	<i>pH</i>	<i>DO</i>	<i>Conductivity</i>	<i>Propylene Glycol</i>	<i>TPH-DRO</i>	<i>TKN</i>	<i>BOD (5 Day)</i>	<i>COD</i>	<i>TSS</i>
OF022	7.52	7.20	210.50	<5.0	0.09	1.15	30.45	29.95	5.70

## 9. Outfall 025

All samples were collected and analyzed in accordance with the permit requirements. There are no limits on any of the parameters for this outfall. Samples for OF025 were collected and representative for each of the four quarters and the average flow was 1.10 MGD. The chart below shows the average value for each parameter.

	<i>pH</i>	<i>DO</i>	<i>Conductivity</i>	<i>Propylene Glycol</i>	<i>TPH-DRO</i>	<i>TKN</i>	<i>BOD (5 Day)</i>	<i>COD</i>	<i>TSS</i>
OF025	7.92	6.65	439.25	<5.0	0.12	0.66	<5.0	35.95	10.98

#### 10. Outfall 026

All samples were collected and analyzed in accordance with the permit requirements. There are no limits on any of the parameters for this outfall. Samples were collected for OF026 for each of the four quarters; however, only one of the samples collected were representative due to no flow during the other two samplings. The average flow was 1.16 MGD. The chart below shows the value for each parameter collected during the representative sample.

	<i>pH</i>	<i>DO</i>	<i>Conductivity</i>	<i>Propylene Glycol</i>	<i>TPH-DRO</i>	<i>TKN</i>	<i>BOD (5 Day)</i>	<i>COD</i>	<i>TSS</i>
<b>OF026</b>	7.67	4.6	420.0	NR	<0.1	<0.5	<5.0	30.0	27.0

#### 11. Outfalls 027, 028, and 029

All samples were collected and analyzed in accordance with the permit requirements. The permit allows for discharge data from Outfall 027 to be submitted as representative of Outfalls 028 and 029. Samples were collected and representative for OF027 each of the four quarters. The average flow was 5.80 MGD. The chart below shows the average value for each parameter.

	<i>pH</i>	<i>DO</i>	<i>Conductivity</i>	<i>Propylene Glycol</i>	<i>TPH-DRO</i>	<i>TKN</i>	<i>BOD (5 Day)</i>	<i>COD</i>	<i>TSS</i>
<b>OF027</b>	7.59	6.48	416.0	<5.0	0.11	0.45	10.85	31.23	10.30

#### 12. Outfall 30

All samples were collected and analyzed in accordance with the permit requirements. There are no limits on any of the parameters for this outfall. Samples were collected for OF30 for all twelve months; however, only ten of the samples were collected during a discharge. The average flow was 3.56 MGD. The chart below shows the average value for each parameter.

	<i>pH</i>	<i>TPH-DRO</i>	<i>TSS</i>
<b>OF030</b>	8.07	0.07	7.10

#### 13. Outfall 031

All samples were collected and analyzed in accordance with the permit requirements. There are no limits on any of the parameters for this outfall. Samples were collected for OF031 all twelve months; however, only seven of the samples were representative due to no flow. The average flow was 0.48 MGD. The chart below shows the average value for each parameter.

	<i>pH</i>	<i>DO</i>	<i>Conductivity</i>	<i>TPH-DRO</i>	<i>TKN</i>	<i>BOD (5 Day)</i>	<i>COD</i>	<i>TSS</i>
<b>OF031</b>	8.38	6.0	357.57	0.11	0.27	238.91	576.86	4.13

During the October through April 2013 period, two deicing events occurred. The average result for propylene glycol concentration was 905 mg/L.



#### 14. Outfall 032

All samples were collected and analyzed in accordance with the permit requirements. This outfall has limits that include a pH value within 6.0 and 9.0 SU, a monthly average for TPH of 15 mg/L and a daily maximum for TPH of 30 mg/L. The pH maximum limit of 9.0 SU was exceeded during the May 2012 through April 2013 sampling period. Samples were collected for OF032 all twelve months; however, only two samples were representative since the other ten samples had no flow. The average flow was 0.24 MGD. The chart below shows the average value for each parameter.

	<i>pH</i>	<i>TPH-DRO</i>	<i>TSS</i>
<b>OF032</b>	10.79	0.15	3.9

#### 15. In-Stream Sampling Location 001 (for cDMR purposes identified as Outfall 551)

All samples were collected and analyzed in accordance with the permit requirements. There are no limits on any of the parameters for this stream sample; however, there is a performance guideline of 100 mg/L for propylene glycol concentrations. Samples were collected for SS001 for all twelve months; representative samples were collected for all twelve months.

During the October through April 2013 period, two deicing events occurred. The propylene glycol concentrations never exceeded the performance target of 100mg/L during the winter season. The highest concentration of propylene glycol was 39.3 mg/L, from field measurement, on March 26, 2013.

Dissolved oxygen, conductivity, BOD<sub>5</sub>, and COD are sampled once per month from May to September and once per event from October to April. The chart below shows the average value for each parameter.

	<i>pH</i>	<i>DO</i>	<i>Conductivity</i>	<i>TPH-DRO</i>	<i>TKN</i>	<i>BOD (5 Day)</i>	<i>COD</i>	<i>TSS</i>
Year-Round	7.33			<0.1	0.69			12.46
May-September		6.54	426.2			<5.0	28.2	
October - April		11.5	754.5			6.6	32.6	

#### 16. In-Stream Sampling Location 002 (for cDMR purposes identified as Outfall 552)

All samples were collected and analyzed in accordance with the permit requirements. There are no limits on any of the parameters for this stream sample. Samples were collected and representative for SS002 for all twelve months. The average flow was 9.49 MGD. The chart below shows the average value for each parameter.

	<i>pH</i>	<i>DO</i>	<i>Conductivity</i>	<i>TPH-DRO</i>	<i>TKN</i>	<i>BOD (5 Day)</i>	<i>COD</i>	<i>TSS</i>
<b>SS002</b>	8.01	7.48	341.75	0.06	0.35	20.31	46.96	16.73

During the October through April 2013 period, two deicing events occurred. The average result for propylene glycol concentration was 9.9 mg/L.

**17. In-Stream Sampling Location 003 (for eDMR purposes identified as Outfall 553)**

All samples were collected and analyzed in accordance with the permit requirements. There are no limits on any of the parameters for this stream sample. Samples were collected for all twelve months; however, only three of the samples were representative. The average flow was 3.21 MGD. The chart below shows the average value for each parameter.

	<i>pH</i>	<i>DO</i>	<i>Conductivity</i>	<i>Propylene Glycol</i>	<i>TPH-DRO</i>	<i>TKN</i>	<i>BOD (5 Day)</i>	<i>COD</i>	<i>TSS</i>
<b>SS003</b>	8.12	5.70	162.33	<5.0	<0.1	0.3	<4.0	22.0	5.87

The table below shows the rainfall data summary by each sampling event.

<b>Summary of Rainfall Data</b>				
<b>Sampling Event</b>	<b>Storm Date</b>	<b>Duration</b> (hr)	<b>Quantity</b> (in)	<b>Previous Storm Date</b>
<b>Monthly Sampling Events</b>				
May 2012	May 9, 2012	18	0.37	April 28, 2012
June 2012	June 12, 2012	18	0.60	June 1, 2012
July 2012	July 9, 2012	12	0.24	July 3, 2012
August 2012	August 9-10, 2012	36	0.88	August 5, 2012
September 2012	September 17-18, 2012	36	1.23	September 8, 2012
October 2012	October 2-3, 2012	24	2.35	September 27, 2012
November 2012	November 12, 2012	24	1.06	October 30, 2012
December 2012	December 9, 2012	8	0.16	November 13, 2012
January 2013	January 14-15, 2013	48	1.04	December 26, 2012
February 2013	February 8, 2013	12	0.19	January 31, 2013
March 2013	March 6, 2013	24	0.95	February 26, 2013
April 2013	April 4, 2013	18	0.26	March 25, 2013
<b>Quarterly Sampling Events</b>				
2nd Quarter 2011	May 14-15, 2012	24	1.14	May 9, 2012
3rd Quarter 2011	September 17-18, 2012	36	1.23	September 8, 2012
4th Quarter 2011	October 15, 2013	12	0.26	October 2, 2012
1st Quarter 2012	February 26, 2013	18	0.75	February 15, 2013
<b>Annual Sampling Events</b>				
Annual 2012	May 9, 2012	24	0.46	April 28, 2012



## 8. ANNUAL ESTIMATE OF TSS LOAD AT SS002 (CUB RUN)

A benthic Total Maximum Daily Load (TMDL) was approved for Bull Run by the U.S. EPA on September 26, 2006. Although storm water runoff from the Airport does not discharge directly to Bull Run, the TMDL took in to account all upstream point source discharges. The area associated with the Waste Load Allocation (WLA) for the Airport took into account only that portion of the Airport property that drains into the Cub Run and Dead Run watersheds. Thus, the WLA only applies to the 11 outfalls that discharge to the Cub Run/Dead Run drainage areas. The Airport was given a TMDL WLA of 275.1 tons per year of Total Suspended Solids (TSS). As such, monitoring for TSS was carried forward with this permit reissuance. Additionally, with this reissuance at least a quarter of the TSS samples had to be collected during a storm event in order to characterize the discharge. An annual estimate of TSS load (tons/year) at SS002 (Cub Run) is provided below:

The TSS Load was found to be 92.9 tons per year. This value was calculated using the formula:

$$Load = \frac{0.226 \times R \times C \times A}{2000}$$

where C is the pollutant concentration, R is runoff, A is area, and 0.226 is the unit conversion factor.

Runoff is calculated using the formula:

$$R = P \times P_j \times R_v$$

where P is the annual rainfall in inches, P<sub>j</sub> is the fraction of events that produce runoff (usually 0.9), and R<sub>v</sub> is equal to 0.05+ (0.9 x impervious fraction [I<sub>a</sub>]).

The annual rainfall was calculated by adding the total rainfall amount from May 2012 to April 2013, which equaled 39.28 inches. The usual value of 0.9 was used for P<sub>j</sub>. The I<sub>a</sub> was determined by divided the amount of impervious surface (849 acres) by the total drainage area of 2560 acres, which resulted in a value of 0.33, thus the R<sub>v</sub> value was calculated to equal 0.35. Entering these values in the equation, the runoff (R) was calculated to be 12.3.

A weighted concentration was used to calculate the pollutant concentration (P). The weighted concentration value is the concentration for each month multiplied by the flow for that month divided by the sum of all flows. This resulted in a pollutant concentration of 39.0 mg/L. The total area of non-impervious surfaces was used for the area (A). Thus, the value for area is 1711 acres.

## 9. IDENTIFICATION OF WATER QUALITY IMPROVEMENTS OR DEGRADATION

Several BMPs identified in the approved DMMP were used effectively this season, which decreased spent glycol runoff, increased recovery, and decreased loadings to improve water quality. Each BMP below was effective during this past season:

1. R gates for centralized deicing – With the trench drains closed and with Airports Operations approval, the northern R gates along Taxiway F were used again this season as a centralized deicing pad. United Express was the primary user of this pad and used the pad for all predicted storms and many frost events.
2. Pad A (12/30 Run-up Block) and Apron W – This past season both these centralized deicing pads were set up for use. United and Swissport were the primary users of these pads for all predicted storms.

## 10. CURRENT STATUS OF ALL TENANTS

This table contains a current listing of all tenants and their co-permittee status as of June 2013.

Company	Address	Co-Permittee Status
5 Star U-Street Parking	50 Rhode Island Ave. #100 Washington, DC 20002	Co-Permittee
Aeroflot Russian Airlines	1634 I Street, NW, Suite 200 Washington, DC 20006	<b>Not a Co-Permittee Failed to respond</b>
Aircraft Service International Group	P.O. Box 16606 Washington, DC 20041	Co-Permittee
Air France	P.O. Box 17709 Washington, DC 20041	Co-Permittee
All Nippon Airways	P.O. Box 17010 Washington, DC 20041	Co-Permittee
American Airlines	P.O. Box 17165 Washington, DC 20041	Co-Permittee
Austrian Airlines	P.O. Box 16979 Washington, DC 20041	Co-Permittee
Avianca Airlines	P.O. Box 16845 Washington, DC 20041	Co-Permittee
British Airways	P.O. Box 17286 Washington, DC 20041	Co-Permittee
Copa Airlines	P.O. Box 20266 Washington, DC 20041	Co-Permittee
Delta Air Lines, Inc.	P.O. Box 17228 Washington, DC 20041	Co-Permittee
Ethiopian Airlines	P.O. Box 16855 Washington, DC 20041	Co-Permittee
Federal Express	23723 Air Freight Lane Sterling, VA 20166	Co-Permittee
FleetPro	23340 Ariane Way Dulles, VA 20166	Co-Permittee
German Armed Forces Command US/CA	23745 Autopilot Drive Washington, DC 20041	Co-Permittee
Ground Services International, Inc.	PO Box 16902 Washington, DC 20041	Co-Permittee
jetBlue Airways	P.O. Box 16901 Washington, DC 20041	Co-Permittee
KLM Royal Dutch Airlines	P.O. Box 17007 Washington, DC 20041	Co-Permittee
Korean Air	P.O. Box 16244 Washington, DC 20041	Co-Permittee
Landmark Aviation	23411 Autopilot Drive Dulles, VA 20166	Co-Permittee
Lufthansa German Airlines	P.O. Box 17703 Washington, DC 20041	Co-Permittee



Company	Address	Co-Permittee Status
Qatar Airways	P.O. Box 17007 Washington, DC 20041	Co-Permittee
Saudi Arabian Airlines	P.O. Box 17499 Washington, DC 20041	Co-Permittee
Scandinavian Airlines System (SAS)	P.O. Box 16914 Washington, DC 20041	Co-Permittee
Signature Flight Support	23950 Windsock Drive Washington, DC 20041	Co-Permittee
South African Airways	P.O. Box 16807 Washington, DC 20041	Co-Permittee
Southwest Airlines	P.O. Box 36647 - 1CR Dallas, TX 75235	Co-Permittee
Swissport Fueling	P.O. Box 20177 Washington, DC 20041	Co-Permittee
Swissport USA	P.O. Box 17558 Washington, DC 20041	Co-Permittee
TACA International Airlines	P.O. Box 20025 Washington, DC 20041	Co-Permittee
U.S. Postal Service	23941 Cargo Drive - Doors 22-25 Sterling, VA 20166	Co-Permittee
United Air Lines (includes Air Canada and Air Wisconsin)	P.O. Box 20200 Washington, DC 20041	Co-Permittee
United Parcel Service (UPS)	P.O. Box 16242 Washington, DC 20041	Co-Permittee
US Airways	P.O. Box 17572 Washington, DC 20041	Co-Permittee
Virgin America	P.O. Box 17572 Washington, DC 20041	Co-Permittee
Virgin Atlantic Airways	P.O. Box 17185 Washington, DC 20041	Co-Permittee
Worldwide Flight Services	23901 Cargo Drive, Door 76 Dulles, VA 20166	Co-Permittee

**APPENDIX A**  
**DEICING FLUID USAGE AND RECOVERY DATA**



Metropolitan Washington Airports Authority  
Washington Dulles International Airport  
VPDES Permit VA0089541  
2012-2013 Annual Report

**SUMMARY OF TENANT MONTHLY DEICING ACTIVITIES FOR 2012 - 2013 WINTER (in gallons)**

ORGANIZATIONS	October-12		November-12		December-12		January-13		February-13		March-13		April-13		WINTER TOTAL	
	Type I	Type IV	Type I	Type IV	Type I	Type IV	Type I	Type IV	Type I	Type IV	Type I	Type IV	Type I	Type IV	Type I	Type IV
Delta	0	0	740	0	1,710	1,850	1,836	1,600	863	300	716	0	0	0	5,865	3,750
Delta Global - Virgin America	0	0	85	0	2,410	90	3,285	335	1,195	95	1,620	310	0	0	8,595	830
FedEx	0	0	151	0	1,690	375	350	100	1,180	75	2,075	225	0	0	5,446	775
Landmark	0	0	96	0	1,134	140	2,108	119	1,897	38	2,091	130	0	0	7,326	427
Piedmont Airlines	120	0	590	0	1,025	230	1,385	280	1,365	340	2,210	415	0	0	6,695	1,265
Signature	0	0	89	0	141	0	418	33	1,308	60	3,341	633	0	0	5,297	726
Southwest	0	0	1,100	0	1,550	100	2,900	450	2,325	130	5,135	400	140	0	13,150	1,080
Swissport - Aeroflot, Air France, AirTran, American, Austrian, Avianca, British Airways, Copa, Emirates, JetBlue, KLM, Korean, SAS, Saudi Arabian, South African, TACA, Qatar, UPS, Virgin Atlantic	150	0	2,155	0	10,850	1,737	15,710	3,020	11,445	1,808	18,350	2,890	0	0	58,660	9,455
United - Air Canada, ANA, Vision	120	0	1,680	0	3,211	486	7,289	1,774	9,552	331	6,654	1,080	0	0	28,506	3,671
United Express - Air Wisconsin	0	0	1,430	0	9,160	3,065	10,865	2,320	10,430	3,600	7,970	3,130	0	0	39,855	12,115
Worldwide Flight Services - Ethiopian, Icelandair, Turkish	0	0	0	0	450	0	145	0	705	0	0	0	0	0	1,300	0
<b>MONTHLY TOTALS</b>	<b>390</b>	<b>0</b>	<b>8,116</b>	<b>0</b>	<b>33,331</b>	<b>8,073</b>	<b>46,291</b>	<b>10,031</b>	<b>42,265</b>	<b>6,777</b>	<b>50,162</b>	<b>9,213</b>	<b>140</b>	<b>0</b>	<b>180,695</b>	<b>34,094</b>
	<b>390</b>		<b>8,116</b>		<b>41,404</b>		<b>56,322</b>		<b>49,042</b>		<b>59,375</b>		<b>140</b>		<b>214,789</b>	

Metropolitan Washington Airports Authority  
Washington Dulles International Airport  
VPDES Permit VA0089541  
2012-2013 Annual Report

**TENANT MONTHLY DEICING ACTIVITIES FOR 2012 - 2013 WINTER - 100% Glycol (in gallons)**

ORGANIZATIONS	Glycol Percentage		October-12		November-12		December-12		January-13		February-13		March-13		April-13		WINTER TOTAL	
	Type I	Type IV	Type I	Type IV	Type I	Type IV	Type I	Type IV	Type I	Type IV	Type I	Type IV	Type I	Type IV	Type I	Type IV	Type I	Type IV
Delta	30%	53%	0	0	222	0	513	971	551	840	259	158	215	0	0	0	1,760	1,969
Delta Global - Virgin America	44%	53%	0	0	37	0	1,060	47	1,445	176	526	50	713	163	0	0	3,781	436
FedEx	44%	50%	0	0	66	0	744	188	154	50	519	38	913	113	0	0	2,396	388
Landmark	51%	52%	0	0	49	0	578	74	1,075	62	967	20	1,066	68	0	0	3,736	224
Piedmont Airlines	44%	53%	53	0	260	0	451	121	609	147	601	179	972	218	0	0	2,946	664
Signature	44%	52%	0	0	39	0	62	0	184	17	576	31	1,470	330	0	0	2,331	379
Southwest	44%	53%	0	0	484	0	682	53	1,276	236	1,023	68	2,259	210	62	0	5,786	567
Swireport - Aeroflot, Air France, AirTran, American, Austrian, Avianca, British Airways, Copa, Emirates, JetBlue, KLM, Korean, SAS, Saudi Arabian, South African, TACA, Qatar, UPS, Virgin Atlantic	44%	50%	66	0	948	0	4,774	869	6,912	1,510	5,036	904	8,074	1,445	0	0	25,810	4,728
United - Air Canada, ANA, Vision	32%	50%	38	0	538	0	1,028	243	2,332	887	3,057	166	2,129	540	0	0	9,122	1,836
United Express - Air Wisconsin	32%	50%	0	0	458	0	2,931	1,533	3,477	1,160	3,338	1,800	2,250	1,565	0	0	12,454	6,058
Worldwide Flight Services - Ethiopian, Icelandair, Turkish	44%	53%	0	0	0	0	198	0	64	0	310	0	0	0	0	0	572	0
<b>MONTHLY TOTALS</b>			<b>157</b>	<b>0</b>	<b>3,101</b>	<b>0</b>	<b>13,021</b>	<b>4,097</b>	<b>18,080</b>	<b>5,086</b>	<b>16,211</b>	<b>3,412</b>	<b>20,063</b>	<b>4,652</b>	<b>62</b>	<b>0</b>	<b>70,694</b>	<b>17,247</b>
			<b>157</b>		<b>3,101</b>		<b>17,118</b>		<b>23,166</b>		<b>19,623</b>		<b>24,714</b>		<b>62</b>		<b>87,941</b>	

Note: Percentage amounts calculated via information from MSDS and mixture information provided by the Airline/Deicing Company



# 2012-2013 MONTHLY SUMMARY OF DEICING FLUID USAGE AND RECOVERY

(All amounts are in gallons of 100% glycol)

Month-Year	Total Amount Applied by Airlines		Total Amount Recovered	Percent Recovered
October-12	Type I Type IV	157.2 0.0	336 gallons @ 12.2% = 41 gallons @ 100%	
<b>TOTAL</b>		<b>157.2</b>	<b>41</b>	<b>26.08%</b>
November-12	Type I Type IV	3,101.0	7,046 gallons @ 14.66% = 1,033	
<b>TOTAL</b>		<b>3,101.0</b>	<b>1,033</b>	<b>33.31%</b>
December-12	Type I Type IV	13,021.1 4,096.8	136,039 gallons @ 6.48% = 8,818	
<b>TOTAL</b>		<b>17,117.9</b>	<b>8,818</b>	<b>51.51%</b>
January-13	Type I Type IV	18,080.1 5,085.8	114,913 gallons @ 13.94% = 16,019	
<b>TOTAL</b>		<b>23,165.9</b>	<b>16,019</b>	<b>69.15%</b>
February-13	Type I Type IV	16,210.7 3,412.4	90,468 gallons @ 15.50% = 14,025	
<b>TOTAL</b>		<b>19,623.1</b>	<b>14,025</b>	<b>71.47%</b>
March-13	Type I Type IV	20,062.5 4,651.8	286,588 gallons @ 5.79% = 16,600	
<b>TOTAL</b>		<b>24,714.3</b>	<b>16,600</b>	<b>67.17%</b>
April-13	Type I Type IV	61.6 0.0	420 gallons @ 18.33% = 77	
<b>TOTAL</b>		<b>61.6</b>	<b>77</b>	<b>125.0%</b>
	Type I	70,694.2	635,810 gallons @ 8.90% = 56,613	
	Type IV	17,246.8		
<b>SEASON TOTAL</b>		<b>87,941.0</b>	<b>56,613</b>	<b>64.38%</b>

\*The monthly totals do not include fluid recovered from spills or disposed of on behalf of air carriers or deicing operators. A total of 12,747 gallons @ 43.43% = 5,536 gallons @ 100% was collected from these operations.

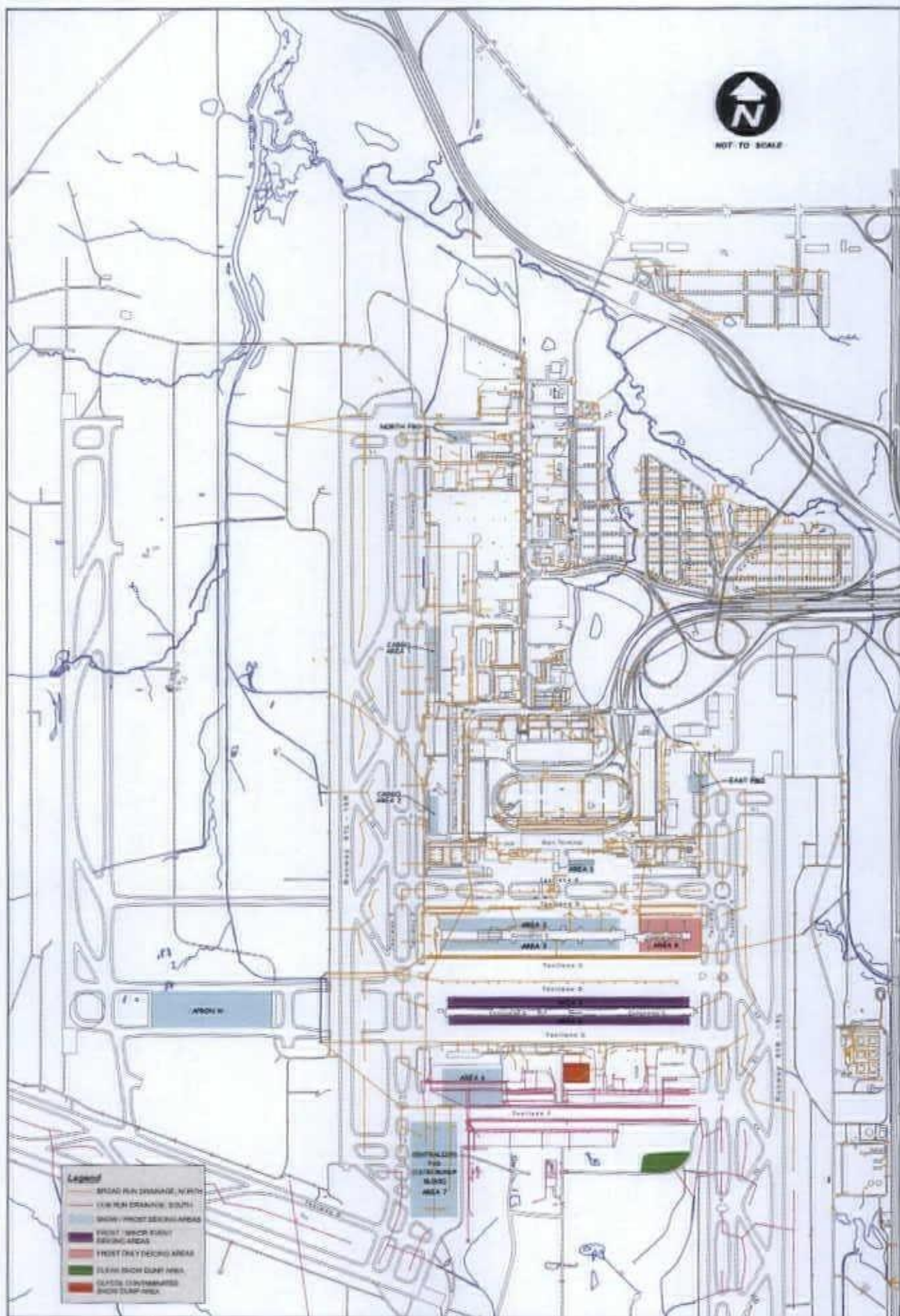
**MAJOR STORM EVENT SUMMARIES OF DEICING FLUID USAGE, RECOVERY, AND SAMPLING RESULTS**

<i>Event Dates</i>	<i>Event Description</i>	<i>Ground Conditions</i>	<i>Duration</i>	<i>Total Gallons Recovered and % Glycol</i>	<i>Amount Recovered @ 100%</i>
<p>The 2012-2013 winter was unusual with total snowfall falling well below average and no major storm events. While there were no real major events there were many small events or events forecast to be significant either missing our area or that came at a point in the season when temperatures were not cold enough to support accumulating snowfall. There were frozen precipitation events on the following dates: 12/24, 12/26, 12/29, 1/27, 1/28 1/29, 1/30, 2/1, 2/2, 2/3, 2/5, 2/8, 2/13, 2/14, 2/15, 2/19 2/22, 3/6, 3/18 and 3/25. The events listed below are the 3 events having the highest volume of fluid recovered; 2 of which came in the month of March which is also unusual.</p>					
December 26, 2012	Light snow began falling @ 6:20am. Light snow continued until 7:30am changing to a brief period of light rain then a period of light freezing rain and mixed with snow at times from 8:15am -11:15am. Light freezing rain changed back to light rain from 11:15am - 6:00pm before changing back to light snow from 6:00pm-10:00pm. Light snow changed back to light rain and drizzle from 10:00pm- 1:00am before the precipitation ended.	Snowfall Total – 1.10." Total Precipitation - 1.41 "	18.5 hours	107,951 gallons @ 5.51%	5,943 gallons
March 6, 2013	Light snow began falling @ 11:20pm on 3/5 and continued overnight into the morning on 3/6. Steady moderate snowfall with periods of heavy snow from 9:00am- 1:00pm. Moderate snowfall changed back to light snow from 1:00pm - 2:30pm then light rain from 2:30pm- 5:00pm before the precipitation ended.	Total Snowfall= 3.3" Total Precipitation= .95"	17.5 hours	102,725 gallons @ 2.73%	2,806 gallons
March 25, 2013	Light snow began falling @ 12:00am switching briefly to light rain the back to light snowfall from 2:30am- 1:00pm. Overcast skies changed to light rain and continued from 2:00pm- 9:00pm before changing back to light snowfall. Light snowfall continued until 2:00am on 3/26 before the precipitation ended.	Snowfall Total – 3.2" Total Precipitation - .44"	26 hours	140,164 gallons @ 5.36%	7,509 gallons





NOT TO SCALE



**METROPOLITAN WASHINGTON  
AIRPORTS AUTHORITY**  
WASHINGTON DULLES INTERNATIONAL AIRPORT  
ENGINEERING DIVISION

**Deicing Areas**

May 10, 2002

APPENDIX B  
SPILL LOGS FOR 2012-2013



Metropolitan Washington Airports Authority  
Washington Dulles International Airport  
YPDES Permit VA 0089541  
2012-2013 Annual Report

Date	Spill Location	Spiller	Incident Description	Type	Quantity	Recovered	Into Drain	Actions
5/13/2012	Gate A2-F Ramp Area	United Express	Leaking valve on Left Wing	Jet-A	5	5	0	Cleaned up with Absorbent
5/27/2012	Gate Z-6	ASIG	Hose storage device loose, when operator engaged fuel transfer pump it caused connection to lead.	Jet-A	1.5	1.5	0	ASIG Cleaned up with Absorbent and Pads
5/23/2012	Gate A-19	Avianca	Put too much fuel in right wing fuel pod	Jet-A	1	1	0	Cleaned up with Absorbent
5/24/2012	Gate B-74	Swissport	Tear in small diameter fuel sensor hose.	Jet-A	3	3	0	Swissport Cleaned up with Absorbent
6/11/2012	Gate A-16	KLM	Unknown	Jet-A	5	5	0	Cleaned up with Absorbent
6/12/2012	Signature Ramp	Signature	Over pressurization of the wing tank	Jet-A	3	3	0	Cleaned up with Absorbent
6/14/2012	Gate D-14 Ramp Area	United Express	Mechanical malfunction of aircraft fuel system	Jet-A	1	1	0	Cleaned up with Absorbent
6/18/2012	Gate D-18 Ramp	ASIG	Hose Rupture	Jet-A	2	2	0	Cleaned up with Absorbent
6/22/2012	Gate D-5 Ramp	United Airlines	Hydraulic line leak from right wing	Hydraulic Fluid	3	3	0	ASIG Cleaned up with Absorbent and Pads
6/29/2012	Gate A-6E/A-6D Ramp Area	ASIG	Mechanical failure of a plastic tube in the pump area	Jet-A	4	4	0	Cleaned up with Absorbent
7/12/2012	Gate A14	Swissport	Overfill	Diesel Fuel	1	1	0	Swissport Cleaned up with Absorbent
7/23/2012	Signature Ramp	Signature	Fuel truck hose released approx. 8 gallons of Jet A while operator rewind the hose on reel.	Jet-A	8	8	0	Cleaned up with Absorbent
8/3/2012	C14 East/West Breezeway Ramp Level Outside CG392	United Airlines	Fuel leaking from generator	Gasoline	1.5	1.5	0	Cleaned up with Absorbent
8/13/2012	Gate B-45	Authority	4065 GPU generator fuel tank clean out plug leaking	Diesel Fuel	1	1	0	Cleaned up with Absorbent
8/24/2012	Gate A-2F Ramp Area	ASIG	Fuel Truck pulled away from aircraft with hose still attached	Jet-A	2	2	0	ASIG Cleaned up with Absorbent and Pads
9/9/2012	Gate 141 & Compass Ct.	LSG Sky Chef	Vehicle struck jersey barrier at Gate 141	Hydraulic Fluid	10	10	0	Cleaned up with Absorbent
9/14/2012	South Mid-Field Fueling Area	ASIG	Operator Error. Vent not closed and product splashed out of overflow when truck was moved	Jet-A	1	1	0	ASIG Cleaned up with Absorbent and Pads
9/24/2012	Gate D-32	ASIG	Nozzle malfunction - Truck #163 (ASIG) placed out of service until repaired.	Jet-A	2	2	0	ASIG Cleaned up with Absorbent and Pads
9/29/2012	Gate C-28	ASIG	Overfill	Jet-A	1	1	0	ASIG Cleaned up with Absorbent and Pads
10/7/2012	Gate A1-C	ASIG	Broken hose on Transmission	Transmission Flu	4	4	0	ASIG Cleaned up with Absorbent and Pads
10/5/2012	Ramp D11	United Airlines	Leak from both in-flight dump valves	Jet-A	2	2	0	Evaporation
10/16/2012	Exxon Service Station	FedEx	Fueling hose separated from fuel pump at the break away valve. Fueler was not at fault.	Diesel Fuel	1	1	0	Cleaned up with Absorbent
10/16/2012	Ariane Way	R.E.H.	Vehicle accident	Diesel Fuel	25	25	0	Cleaned up with Absorbent
10/19/2012	R19 Fueling Area	ASIG	Overflowed Fuel Truck - Bad jet sensor	Jet-A	20	20	0	ASIG Cleaned up with Absorbent and Pads
10/19/2012	Gate C-18	ASIG	Overfill by ASIG Fuel Truck. Truck left scene prior to FD arrival.	Jet-A	2	2	0	ASIG Cleaned up with Absorbent and Pads
10/25/2012	JP Morgan Chase	Authority	Gas can turned over in the back of Y204	Gasoline	1.5	1.5	0	Cleaned up with Absorbent
10/28/2012	Gate B-73	Swissport	Left vent valve not closing	Jet-A	2	2	0	Swissport Cleaned up with Absorbent
11/4/2012	Gate D-4	United Express	Per aircraft maintenance, malfunctioning valve on aircraft	Jet-A	15	15	0	ASIG Cleaned up with Absorbent and Pads
11/10/2012	Ramp B63/B65	Swissport	Leaking valve on the ground fueling port end of the hose	Jet-A	2	2	0	Swissport Cleaned up with Absorbent



Metropolitan Washington Airports Authority  
Washington Dulles International Airport  
VPDES Permit VA 0089541  
2012-2013 Annual Report

Date	Spill Location	Spiller	Incident Description	Type	Quantity	Recovered	Into Drain	Actions
11/15/2012	FedEx Cargo - Position 6	FedEx	Fuel vented from right wing tip vent valve during refueling operation	Jet-A	2	2	0	Cleaned up with Absorbent
11/23/2012	Gate D-18 Ramp	ASIG	Fueling Cart 212 developed a leak at the pressure relief valve.	Jet-A	2	2	0	ASIG Cleaned up with Absorbent and Pads
11/21/2012	Gate B-37 Ramp	Swissport	Build up of pressure in the fuel hose on the elevated platform, as it was being disconnected from the aircraft	Jet-A	7	7	0	Swissport Cleaned up with Absorbent
11/28/2012	Gate D-2 Ramp	ASIG	Overflow of the induction overflow tanks. Malfunctioning shut-off valve.	Jet-A	5	5	0	ASIG Cleaned up with Absorbent and Pads
1/5/2013	Gate C-26	United	Automatic sump valve failure	JP-1	20	20	0	ASIG Cleaned up with Absorbent and Pads
1/6/2013	Gate C-18	United Express	Automatic sump valve failure	Jet-A	20	20	0	Cleaned up with Absorbent
1/18/2013	Gate C-5	ASIG	Fuel leaked while disconnecting hose from aircraft	Jet-A	3	3	0	ASIG Cleaned up with Absorbent and Pads
2/1/2013	Gate C-27 Ramp	United	Pressure relief valve in right wing malfunction	Jet-A	60	60	0	Cleaned up with Absorbent
2/4/2013	South Mid-Field Fueling Station - Fuel Island	ASIG	Leaking from vehicle fuel tank	Gasoline	1	1	0	ASIG Cleaned up with Absorbent and Pads
2/7/2013	Gate R-12	North American Airlines	Bad seal on aircraft wing access panel	Jet-A	1	1	0	Cleaned up with Absorbent
2/8/2013	Gate C-18	ASIG	Ruptured line	Jet-A	2	2	0	Cleaned up with Absorbent
2/18/2013	South Mid-Field Fueling Station	ASIG	Defective/faulty emergency shut off valve on tanker allowing fuel to overflow out of top of tank	Jet-A	40	40	0	ASIG Cleaned up with Absorbent and Pads
3/3/2013	Gate C-4	United	Accidental activation fo fuel dump	Jet-A	1	1	0	ASIG Cleaned up with Absorbent and Pads
3/8/2013	Wash Facility - Shop 2	Authority	Truck hit a pole coming out of the wash facility resulting in loss of fluid	Transmission Fluid	30	30	0	Cleaned up with Absorbent
3/10/2013	Gate D-10	United	Sump port on aircraft left wing broke causing active leak under left wing and fuselage area	Jet-A	10	10	0	ASIG Cleaned up with Absorbent and Pads
3/7/2013	Sky Chef - 45055 Compass Court	ER Transport	While entering the park lot, the front jacks of the trailer were damaged which broke the fuel lines from the trailer fuel tank to the refrigerator unit	Diesel	1	1	0	Cleaned up with Absorbent
3/13/2013	Gate D-1	ASIG	Residue leak from nozzle when disconnected from aircraft	Jet-A	1	1	0	ASIG Cleaned up with Absorbent and Pads
3/20/2013	Gate A-23	ASIG	Supply hose leaked due to break in hose on pump truck	Jet-A	5	5	0	ASIG Cleaned up with Absorbent and Pads
3/23/2013	Gate C-24	United	Unknown	Jet-A	1	1	0	ASIG Cleaned up with Absorbent and Pads
4/5/2013	Gate C-4	United	Failed to maintain control of nozzle when re-fueling vehicle	Diesel	15	15	0	Cleaned up with Absorbent
4/9/2013	Gate B-75 Ramp	Swissport	Operator failed to dump recovery tank, so when system was pressurized it caused the system to overflow onto ground	Jet-A	1	1	0	Swissport cleaned up with Absorbent and Pads
4/11/2013	Gate H-19 at Main Terminal	Authority	Leaking fuel line to APU engine	Diesel	10	10	0	Cleaned up with Absorbent
4/14/2013	At fuel pumps between Gates D3 and D5	United Express	Over fill of fuel tank with a valve left open	Diesel	3	3	0	Cleaned up with Absorbent



Metropolitan Washington Airports Authority  
 Washington Dulles International Airport  
 VPDES Permit VA 0089541  
 2012-2013 Annual Report

Date	Spill Location	Spiller	Incident Description	Type	Quantity	Recovered	Into Drain	Actions
4/11/2013	Southside Employee Parking Lot	ASIG	Popit valve (inside) failure	Diesel	10	10	0	Cleaned up with Absorbent
4/13/2013	Landmark Aviation Ramp	Landmark	A mechanical failure on an aircraft	Jet-A	20	5	15	Cleaned up with Absorbent. MWAA Fire Department and Triumvirate performed clean-up in the waterway by SS003. IR#2013-N-2724
4/16/2013	IAB Loading Dock - IG4 and IG5	Authority	High pressure hydraulic hose on the lift pump broke	Hydraulic Fluid	50	50	0	Cleaned up with Absorbent.
4/20/2013	Gate D-6	United Express	Unknown	Jet-A	1	1	0	ASIG Cleaned up with Absorbent and Pads
4/28/2013	Gate C-18 Ramp Area	United Express	Fuel splashed back while filling an over the wing fill	Jet-A	2	2	0	ASIG Cleaned up with Absorbent and Pads
TOTAL:					459.5	444.5	15	

**APPENDIX C**  
**MONITORING OUTFALL LOCATIONS**





NOT TO SCALE

### Legend

- STREAM SAMPLES
- ◆ INTERNAL OUTFALLS: MONTHLY
- ◆ INTERNAL OUTFALLS: QUARTERLY
- ◆ INTERNAL OUTFALLS: ANNUALLY



July 20, 2009

**METROPOLITAN WASHINGTON  
AIRPORTS AUTHORITY**  
WASHINGTON DULLES INTERNATIONAL AIRPORT  
ENGINEERING DIVISION

**Outfall Locations**

APPENDIX D  
MONITORING DATA



Washington Dulles International Airport  
VPDES Permit Stormwater Runoff Monitoring Project Annual Report  
May 2012 through April 2013  
VPDES Permit Number VA0089541

Monthly Sampling Locations  
Outfall OF 001

Sample Period		May	June	July	August	September	October	November	December	January	February	March	April
Sample Date:		5/10/12	6/13/12	7/9/12	8/10/12	9/18/12	10/3/12	11/13/12	12/10/12	1/15/13	2/8/13	3/7/13	4/5/13
Analyte	Units	Field Measurements and Laboratory Analyses											
pH		8.07	8.62	7.57	7.84	8.10	8.79	8.72	7.78	9.20	8.27	8.89	7.01
Temperature	°C	15.6	19.2	22.7	23.2	21.2	20.5	10.9	13.2	8.5	7.1	7.3	8.7
Conductivity	umhos	397	359	330	137	259	296	140	420	195	531	298	429
Dissolved Oxygen	mg/l	6.1	6.2	6.5	5.2	4.7	6.2	7.7	5.7	7.1	8.7	7.3	7.2
BOD (5 days)	mg/l	7	<4	<10	4	5	110	<4	8	96.5	257	95.3	1,190
COD	mg/l	34	<10	30	40	32	17	17	45	132	726	185	1,630
Propylene Glycol	mg/l						<5.0	<5.0	<5.0	27	290	18	630
TPH-DRO	ug/l	0.23	0.073	0.53	0.15	0.19	0.076	0.054	0.11	0.38	0.21	0.16	0.64
Total Suspended Solids	mg/l	7.8	8.2	3.8	3.3	4.4	2.6	8.2	4.7	6.1	6.8	7.2	9.1
Total Kjeldahl Nitrogen	mg/l	0.7	<0.5	<0.5	0.8	<0.5	0.6	<0.5	<0.5	1.1	<0.5	<0.5	3.4
Visual Observations													
Color		Clear	Clear	Clear	Lt. green	Lt. brown	Clear	Lt. brown	Clear	Clear	Lt. brown	Clear	Clear
Odor		None	None	None	None	None	None	None	None	None	None	None	None
Clarity		Clear	Clear	Clear	Clear	Opaque	Clear	Clear	Clear	Clear	Clear	Clear	Clear
Floating solids		Yes	None	Yes	None	None	None	None	Yes	Yes	None	Yes	None
Suspended solids		Yes	None	Yes	Yes	Yes	None	None	Yes	None	None	Yes	None
Settled solids		None	Yes	Yes	Yes	Yes	None	None	Yes	None	None	Yes	None
Foam		None	None	None	None	None	None	None	None	None	None	None	None
Oily sheen		None	None	None	None	None	None	None	None	None	None	Yes	Yes
Other		None	None	None	None	None	None	None	None	None	None	None	None
Calculated Discharge													
Velocity	ft/sec	0.83	1.21	0.51	0.83	0.78	0.33	0.65	0.66	NF	NF	NF	NF
Discharge	ft <sup>3</sup> /sec	4.01	2.90	1.85	15.9	7.51	5.93	18.8	1.57	0.00	0.00	0.00	0.00

Notes:

1. NF - No flow. Water at this location was stagnant.
2. Results containing a less than "<" sign indicate that the parameter was not detected above the laboratory reporting limit. The number that follows the less than sign is the laboratory reporting limit. One half of the laboratory reporting limit is used for these results in the statistical analyses.
3. Values shown in *italics* were reported by the laboratory with a "J" qualifier. The J qualifier indicates that the analyte was identified below the reporting limit but greater than the limit of detection. The value provided is an estimate.
4. Values shown in **Bold** are the results from locations that were resampled. Resampling was required because initial laboratory analysis was resulted in reporting limits that were above the requirements in the VPDES permit.



Washington Dulles International Airport  
VPDES Permit Stormwater Runoff Monitoring Project Annual Report  
May 2012 through April 2013  
VPDES Permit Number VA0089541

Monthly Sampling Locations  
Outfall OF 002

Sample Period		May	June	July	August	September	October	November	December	January	February	March	April
Sample Date:		5/10/12	6/13/12	7/9/12	8/10/12	9/18/12	10/3/12	11/13/12	12/10/12	1/15/13	2/8/13	3/7/13	4/5/13
Analyte	Units	Field Measurements and Laboratory Analyses											
pH		8.02	9.15	7.35	7.73	7.90	11.55	10.03	7.60	<b>7.28</b>	8.13	9.98	9.86
Temperature	°C	14.2	18.8	22.2	23.7	20.2	20.3	10.4	11.0	<b>5.7</b>	7.0	5.2	8.6
Conductivity	umhos	306	302	356	216	374	823	118	353	<b>142</b>	945	426	392
Dissolved Oxygen	mg/l	5.2	4.5	4.0	5.8	4.0	5.7	8.9	7.3	<b>9.4</b>	8.5	8.7	7.3
BOD (5 days)	mg/l	13	<4	<10	4	<4	30	<4	<4	<b>12.5</b>	341	14.5	97.4
COD	mg/l	15	11	19	49	15	28	15	19	34	1,230	55.7	146
Propylene Glycol	mg/l						<5.0	<5.0	<5.0	<5.0	340	14	20
TPH-DRO	ug/l	0.094	0.056	0.28	0.044	0.096	0.15	0.088	0.058	0.12	0.20	0.050	0.60
Total Suspended Solids	mg/l	6.2	57	4.5		37	430	25	10	57	12	77	20
Total Kjeldahl Nitrogen	mg/l	<0.5	<0.5	<0.5	1.0	<0.5	1.1	<0.5	<0.5	<b>6.9</b>	0.65	<0.5	0.66
Visual Observations													
Color		Clear	Clear	Clear	Clear	Clear	Lt. green	Lt. brown	Clear	Clear	Lt. brown	Lt. green	Clear
Odor		None	None	None	None	None	None	None	None	None	None	Glycol	None
Clarity		Clear	Clear	Clear	Clear	Clear	Opaque	Opaque	Clear	Clear	Clear	Clear	Clear
Floating solids		None	None	None	None	None	None	Yes	None	None	None	None	None
Suspended solids		None	None	None	None	None	Yes	Yes	None	None	Yes	None	Yes
Settled solids		None	Yes	Yes	None	None	None	Yes	None	None	Yes	None	None
Foam		None	None	None	None	None	Yes	None	None	None	None	Yes	None
Oily sheen		None	None	Yes	Yes	None	None	None	None	None	None	None	None
Other		None	None	None	None	None	Excessive Foam	None	None	None	None	None	None
Calculated Discharge													
Velocity	ft/sec	0.93	1.20	0.51	1.54	0.38	1.20	0.74	0.44	0.93	1.32	1.38	1.65
Discharge	ft <sup>3</sup> /sec	0.176	0.643	0.0187	1.26	0.0139	0.639	0.603	0.0041	0.0341	0.0480	0.0503	0.060

Notes:

1. NF - No flow. Water at this location was stagnant.
2. Results containing a less than '<' sign indicate that the parameter was not detected above the laboratory reporting limit. The number that follows the less than sign is the laboratory reporting limit. One half of the laboratory reporting limit is used for these results in the statistical analyses.
3. Values shown in *Italics* were reported by the laboratory with a "J" qualifier. The J qualifier indicates that the analyte was identified below the reporting limit but greater than the limit of detection. The value provided is an estimate.
4. Values shown in **Bold** are the results from locations that were resampled. Resampling was required because initial laboratory analysis was resulted in reporting limits that were above the requirements in the VPDES permit.



Washington Dulles International Airport  
VPDES Permit Stormwater Runoff Monitoring Project Annual Report  
May 2012 through April 2013  
VPDES Permit Number VA0089541

Monthly Sampling Locations  
Outfall OF 003

Sample Period		May	June	July	August	September	October	November	December	January	February	March	April
Sample Date:		5/10/12	6/13/12	7/9/12	8/10/12	9/18/12	10/3/12	11/13/12	12/10/12	1/15/13	2/8/13	3/7/13	4/5/13
Analyte	Units	Field Measurements and Laboratory Analyses											
pH		6.92	7.51	7.21	7.75	6.98	7.40	9.49	7.31	7.12	7.21	6.90	7.83
Temperature	°C	15.5	19.8	23.6	24.2	21.4	21.6	12.4	12.1	10.5	8.5	7.8	9.0
Conductivity	umhos	312	282	250	150	210	323	152	401	303	1,732	729	464
Dissolved Oxygen	mg/l	6.6	6.2	6.0	7.0	7.0	6.5	7.9	5.7	7.2	8.0	7.7	6.5
BOD (5 days)	mg/l	6	<4	<4	<4	<4	28	8	12	61.6	823	>98.9	163
COD	mg/l	15	<10	19	30	17	21	21	34	80	1,620	303	233
Propylene Glycol	mg/l						<5.0	<5.0	<5.0	6.5	140	6.1	11
TPH-DRO	ug/l	0.15	0.051	0.33	0.24	0.048	0.067	0.074	0.10	0.18	0.14	0.20	0.34
Total Suspended Solids	mg/l	2.6	1.8	3.0	4.0	2.9	1.6	3.2	3.8	17.0	6.2	2.9	4.7
Total Kjeldahl Nitrogen	mg/l	0.7	<0.5	0.6	0.8	<0.5	0.6	<0.5	<0.5	0.8	0.56	<0.5	0.69
Visual Observations													
Color		Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
Odor		None	None	None	None	None	None	None	None	None	None	Yes	None
Clarity		Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
Floating solids		None	Yes	None	None	None	None	None	Yes	Yes	None	None	None
Suspended solids		None	Yes	None	None	None	None	None	Yes	Yes	None	None	None
Settled solids		None	Yes	Yes	None	Yes	None	None	Yes	Yes	None	None	None
Foam		None	None	None	None	None	None	None	None	None	None	None	None
Oily sheen		None	None	Yes	Yes	Yes	None	None	None	None	None	None	None
Other		None	Trash	None	None	None	None	None	None	None	None	None	None
Calculated Discharge													
Velocity	ft/sec	1.60	0.77	1.65	1.59	0.91	1.87	1.53	0.83	1.14	1.28	0.98	1.15
Discharge	ft <sup>3</sup> /sec	3.84	2.78	1.58	7.26	0.549	4.49	9.18	0.398	0.821	1.53	1.17	1.38

Notes:

1. NF - No flow. Water at this location was stagnant.
2. Results containing a less than '<' sign indicate that the parameter was not detected above the laboratory reporting limit. The number that follows the less than sign is the laboratory reporting limit. One half of the laboratory reporting limit is used for these results in the statistical analyses.
3. Values shown in *italics* were reported by the laboratory with a "J" qualifier. The J qualifier indicates that the analyte was identified below the reporting limit but greater than the limit of detection. The value provided is an estimate.
4. Values shown in **Bold** are the results from locations that were resampled. Resampling was required because initial laboratory analysis was resulted in reporting limits that were above the requirements in the VPDES permit.

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Quarterly Sampling Locations  
Outfall OF 004

Sampling Period		2 <sup>nd</sup> Quarter 2012	3 <sup>rd</sup> Quarter 2012	4 <sup>th</sup> Quarter 2012	1 <sup>st</sup> Quarter 2013
Sampling Date		5/16/12	9/18/12	10/16/12	2/27/13
Analyte	Units	Field Measurements and Laboratory Analyses			
pH					
Temperature	°C				
Conductivity	umhos				
Dissolved oxygen	mg/l				
BOD (5 days)	mg/l				
COD	mg/l				
Propylene Glycol	mg/l				
TPH-DRO	ug/l				
TSS	mg/l				
Total Kjeldahl Nitrogen	mg/l				
Visual Observations					
Color		Clear	Lt. brown	Clear	Brown
Odor		None	None	None	None
Clarity		Clear	Clear	Clear	Opaque
Floating solids		None	Yes	None	Yes
Suspended solids		None	None	None	Yes
Settled solids		None	None	None	Yes
Foam		None	None	None	None
Oily sheen		None	None	None	None
Other		None	None	None	None
Calculated Discharge					
Velocity	ft/sec				
Discharge	ft <sup>3</sup> /sec				

Notes:

1. NF - No flow. Water at this location was stagnant.
2. Results containing a less than '<' sign indicate that the parameter was not detected above the laboratory reporting limit. The number that follows the less than sign is the laboratory reporting limit. One
3. Dry - There was no water at this location.
4. Values shown in *Italics* were reported by the laboratory with a "J" qualifier. The J qualifier indicates that the analyte was identified below the reporting limit but greater than the limit of



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Quarterly Sampling Locations  
Outfall OF 005

Sampling Period		2 <sup>nd</sup> Quarter 2012	3 <sup>rd</sup> Quarter 2012	4 <sup>th</sup> Quarter 2012	1 <sup>st</sup> Quarter 2013
Sampling Date		5/15/12	9/18/12	10/16/12	2/27/13
Analyte	Units	Field Measurements and Laboratory Analyses			
pH		7.20	7.30	7.04	7.61
Temperature	°C	17.8	20.6	16.6	6.8
Conductivity	umhos	160	184	417	314
Dissolved oxygen	mg/l	8.0	6.1	6.4	8.5
BOD (5 days)	mg/l	<4	<4	20	10.8
COD	mg/l	34	38	28	42.1
Propylene Glycol	mg/l			<5.0	<5.0
TPH-DRO	ug/l	0.11	0.049	0.051	0.11
TSS	mg/l	4.2	4.0	4.1	2.6
Total Kjeldahl Nitrogen	mg/l	1.3	<0.5	1.3	0.79
Visual Observations					
Color		Lt. brown	Brown	Lt. brown	Brown
Odor		None	None	None	None
Clarity		Opaque	Opaque	Opaque	Opaque
Floating solids		None	Yes	None	None
Suspended solids		Yes	Yes	None	Yes
Settled solids		Yes	Yes	Yes	Yes
Foam		None	None	None	Yes
Oily sheen		Yes	Yes	None	Yes
Other		None	None	None	None
Calculated Discharge					
Velocity	ft/sec	0.51	NF	NF	0.19
Discharge	ft <sup>3</sup> /sec	5.51	0.00	0.00	2.01

Notes:

1. NF - No flow. Water at this location was stagnant.
2. Results containing a less than '<' sign indicate that the parameter was not detected above the laboratory reporting limit. The number that follows the less than sign is the laboratory reporting limit. One
3. Dry - There was no water at this location.
4. Values shown in *italics* were reported by the laboratory with a "J" qualifier. The J qualifier indicates that the analyte was identified below the reporting limit but greater than the limit of

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**Quarterly Sampling Locations  
Outfall OF 006**

Sampling Period		2 <sup>nd</sup> Quarter 2012	3 <sup>rd</sup> Quarter 2012	4 <sup>th</sup> Quarter 2012	1 <sup>st</sup> Quarter 2013
Sampling Date		5/15/12	9/18/12	10/16/12	2/27/13
Analyte	Units	Field Measurements and Laboratory Analyses			
pH					
Temperature	°C				
Conductivity	umhos				
Dissolved oxygen	mg/l				
BOD (5 days)	mg/l				
COD	mg/l				
Propylene Glycol	mg/l				
TPH-DRO	ug/l				
TSS	mg/l				
Total Kjeldahl Nitrogen	mg/l				
Visual Observations					
Color		Clear	Clear	Clear	Brown
Odor		None	None	None	None
Clarity		Clear	Clear	Clear	Opaque
Floating solids		Yes	Yes	Yes	Yes
Suspended solids		Yes	None	None	Yes
Settled solids		Yes	None	None	Yes
Foam		None	None	None	Yes
Oily sheen		None	None	None	None
Other		None	None	None	None
Calculated Discharge					
Velocity	ft/sec				
Discharge	ft <sup>3</sup> /sec				

**Notes:**

1. NF - No flow. Water at this location was stagnant.
2. Results containing a less than "<" sign indicate that the parameter was not detected above the laboratory reporting limit. The number that follows the less than sign is the laboratory reporting limit. One
3. Dry - There was no water at this location.
4. Values shown in *italics* were reported by the laboratory with a "J" qualifier. The J qualifier indicates that the analyte was identified below the reporting limit but greater than the limit of



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**Quarterly Sampling Locations  
Outfall OF 007**

Sampling Period		2 <sup>nd</sup> Quarter 2012	3 <sup>rd</sup> Quarter 2012	4 <sup>th</sup> Quarter 2012	1 <sup>st</sup> Quarter 2013
Sampling Date		5/15/12	9/18/12	10/16/12	2/27/13
Analyte	Units	Field Measurements and Laboratory Analyses			
pH					
Temperature	°C				
Conductivity	umhos				
Dissolved oxygen	mg/l				
BOD (5 days)	mg/l				
COD	mg/l				
Propylene Glycol	mg/l				
TPH-DRO	ug/l				
TSS	mg/l				
Total Kjeldahl Nitrogen	mg/l				
Visual Observations					
Color		Brown	Clear	Clear	Brown
Odor		None	None	None	None
Clarity		Opaque	Clear	Clear	Opaque
Floating solids		None	None	Yes	None
Suspended solids		Yes	None	None	Yes
Settled solids		Yes	Yes	Yes	Yes
Foam		None	None	None	None
Oily sheen		None	None	None	None
Other		None	None	None	None
Calculated Discharge					
Velocity	ft/sec				
Discharge	ft <sup>3</sup> /sec				

**Notes:**

1. NF - No flow. Water at this location was stagnant.
2. Results containing a less than '<' sign indicate that the parameter was not detected above the laboratory reporting limit. The number that follows the less than sign is the laboratory reporting limit. One
3. Dry - There was no water at this location.
4. Values shown in *Italics* were reported by the laboratory with a "J" qualifier. The J qualifier indicates that the analyte was identified below the reporting limit but greater than the limit of

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**Quarterly Sampling Locations  
Outfall OF 008**

Sampling Period		2 <sup>nd</sup> Quarter 2012	3 <sup>rd</sup> Quarter 2012	4 <sup>th</sup> Quarter 2012	1 <sup>st</sup> Quarter 2013
Sampling Date		5/15/12	9/18/12	10/16/12	2/27/13
Analyte	Units	Field Measurements and Laboratory Analyses			
pH					
Temperature	°C				
Conductivity	umhos				
Dissolved oxygen	mg/l				
BOD (5 days)	mg/l				
COD	mg/l				
Propylene Glycol	mg/l				
TPH-DRO	ug/l				
TSS	mg/l				
Total Kjeldahl Nitrogen	mg/l				
Visual Observations					
Color		Brown	Clear	Clear	Brown
Odor		None	None	None	None
Clarity		Opaque	Clear	Clear	Opaque
Floating solids		None	None	Yes	None
Suspended solids		Yes	None	None	Yes
Settled solids		Yes	Yes	Yes	Yes
Foam		None	None	None	None
Oily sheen		None	None	None	None
Other		None	None	None	None
Calculated Discharge					
Velocity	ft/sec				
Discharge	ft <sup>3</sup> /sec				

Notes:

1. NF - No flow. Water at this location was stagnant.
2. Results containing a less than '<' sign indicate that the parameter was not detected above the laboratory reporting limit. The number that follows the less than sign is the laboratory reporting limit. One
3. Dry - There was no water at this location.
4. Values shown in *Italics* were reported by the laboratory with a "J" qualifier. The J qualifier indicates that the analyte was identified below the reporting limit but greater than the limit of



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Quarterly Sampling Locations  
Outfall OF 009

Sampling Period		2 <sup>nd</sup> Quarter 2012	3 <sup>rd</sup> Quarter 2012	4 <sup>th</sup> Quarter 2012	1 <sup>st</sup> Quarter 2013
Sampling Date		5/15/12	9/18/12	10/16/12	2/27/13
Analyte	Units	Field Measurements and Laboratory Analyses			
pH					
Temperature	°C				
Conductivity	umhos				
Dissolved oxygen	mg/l				
BOD (5 days)	mg/l				
COD	mg/l				
Propylene Glycol	mg/l				
TPH-DRO	ug/l				
TSS	mg/l				
Total Kjeldahl Nitrogen	mg/l				
Visual Observations					
Color		Brown	Clear	Clear	Clear
Odor		None	None	None	None
Clarity		Opaque	Clear	Clear	Clear
Floating solids		None	None	None	None
Suspended solids		Yes	None	None	None
Settled solids		Yes	None	None	None
Foam		None	None	None	None
Oily sheen		None	None	None	None
Other		None	None	None	None
Calculated Discharge					
Velocity	ft/sec				
Discharge	ft <sup>3</sup> /sec				

Notes:

1. NF - No flow. Water at this location was stagnant.
2. Results containing a less than '<' sign indicate that the parameter was not detected above the laboratory reporting limit. The number that follows the less than sign is the laboratory reporting limit. One
3. Dry - There was no water at this location.
4. Values shown in *Italics* were reported by the laboratory with a "J" qualifier. The J qualifier indicates that the analyte was identified below the reporting limit but greater than the limit of

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**Quarterly Sampling Locations  
Outfall OF 010**

Sampling Period		2 <sup>nd</sup> Quarter 2012	3 <sup>rd</sup> Quarter 2012	4 <sup>th</sup> Quarter 2012	1 <sup>st</sup> Quarter 2013
Sampling Date		5/15/12	9/18/12	10/16/12	2/27/13
Analyte	Units	Field Measurements and Laboratory Analyses			
pH					
Temperature	°C				
Conductivity	umhos				
Dissolved oxygen	mg/l				
BOD (5 days)	mg/l				
COD	mg/l				
Propylene Glycol	mg/l				
TPH-DRO	ug/l				
TSS	mg/l				
Total Kjeldahl Nitrogen	mg/l				
Visual Observations					
Color		Brown	Clear	Clear	Clear
Odor		None	None	None	None
Clarity		Opaque	Clear	Clear	Clear
Floating solids		None	None	None	None
Suspended solids		Yes	None	None	None
Settled solids		Yes	None	None	None
Foam		None	None	None	None
Oily sheen		None	None	None	None
Other		None	None	None	None
Calculated Discharge					
Velocity	ft/sec				
Discharge	ft <sup>3</sup> /sec				

**Notes:**

1. NF - No flow. Water at this location was stagnant.
2. Results containing a less than '<' sign indicate that the parameter was not detected above the laboratory reporting limit. The number that follows the less than sign is the laboratory reporting limit. One
3. Dry - There was no water at this location.
4. Values shown in *Italics* were reported by the laboratory with a "J" qualifier. The J qualifier indicates that the analyte was identified below the reporting limit but greater than the limit of



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Quarterly Sampling Locations  
Outfall OF 011

Sampling Period		2 <sup>nd</sup> Quarter 2012	3 <sup>rd</sup> Quarter 2012	4 <sup>th</sup> Quarter 2012	1 <sup>st</sup> Quarter 2013
Sampling Date		5/15/12	9/18/12	10/16/12	2/27/13
Analyte	Units	Field Measurements and Laboratory Analyses			
pH					
Temperature	°C				
Conductivity	umhos				
Dissolved oxygen	mg/l				
BOD (5 days)	mg/l				
COD	mg/l				
Propylene Glycol	mg/l				
TPH-DRO	ug/l				
TSS	mg/l				
Total Kjeldahl Nitrogen	mg/l				
Visual Observations:					
Color		Clear	Clear	Clear	Clear
Odor		None	None	None	None
Clarity		Clear	Clear	Clear	Clear
Floating solids		None	None	None	None
Suspended solids		None	None	None	None
Settled solids		None	None	None	None
Foam		None	None	None	None
Oily sheen		None	None	None	None
Other		None	None	None	None
Calculated Discharge					
Velocity	ft/sec				
Discharge	ft <sup>3</sup> /sec				

Notes:

1. NF - No flow. Water at this location was stagnant.
2. Results containing a less than '<' sign indicate that the parameter was not detected above the laboratory reporting limit. The number that follows the less than sign is the laboratory reporting limit. One
3. Dry - There was no water at this location.
4. Values shown in *italics* were reported by the laboratory with a "J" qualifier. The J qualifier indicates that the analyte was identified below the reporting limit but greater than the limit of

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**Quarterly Sampling Locations  
Outfall OF 012**

Sampling Period		2 <sup>nd</sup> Quarter 2012	3 <sup>rd</sup> Quarter 2012	4 <sup>th</sup> Quarter 2012	1 <sup>st</sup> Quarter 2013
Sampling Date		5/15/12	9/18/12	10/16/12	2/27/13
Analyte	Units	Field Measurements and Laboratory Analyses			
pH					
Temperature	°C				
Conductivity	umhos				
Dissolved oxygen	mg/l				
BOD (5 days)	mg/l				
COD	mg/l				
Propylene Glycol	mg/l				
TPH-DRO	ug/l				
TSS	mg/l				
Total Kjeldahl Nitrogen	mg/l				
Visual Observations					
Color		Clear	Clear	Clear	Clear
Odor		None	None	None	None
Clarity		Clear	Clear	Clear	Clear
Floating solids		None	None	None	None
Suspended solids		None	None	None	None
Settled solids		None	None	None	None
Foam		None	None	None	None
Oily sheen		None	None	None	None
Other		None	None	None	None
Calculated Discharge					
Velocity	ft/sec				
Discharge	ft <sup>3</sup> /sec				

Notes:

1. NF - No flow. Water at this location was stagnant.
2. Results containing a less than '<' sign indicate that the parameter was not detected above the laboratory reporting limit. The number that follows the less than sign is the laboratory reporting limit. One
3. Dry - There was no water at this location.
4. Values shown in *Italics* were reported by the laboratory with a "J" qualifier. The J qualifier indicates that the analyte was identified below the reporting limit but greater than the limit of



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**Quarterly Sampling Locations  
Outfall OF 013**

Sampling Period		2 <sup>nd</sup> Quarter 2012	3 <sup>rd</sup> Quarter 2012	4 <sup>th</sup> Quarter 2012	1 <sup>st</sup> Quarter 2013
Sampling Date		5/15/12	9/18/12	10/16/12	2/27/13
Analyte	Units	Field Measurements and Laboratory Analyses			
pH					
Temperature	°C				
Conductivity	umhos				
Dissolved oxygen	mg/l				
BOD (5 days)	mg/l				
COD	mg/l				
Propylene Glycol	mg/l				
TPH-DRO	ug/l				
TSS	mg/l				
Total Kjeldahl Nitrogen	mg/l				
Visual Observations					
Color		Clear	Clear	Clear	Brown
Odor		None	None	None	None
Clarity		Clear	Clear	Clear	Opaque
Floating solids		None	None	None	None
Suspended solids		None	None	None	Yes
Settled solids		None	None	None	Yes
Foam		None	None	None	None
Oily sheen		None	None	None	None
Other		None	None	None	None
Calculated Discharge					
Velocity	ft/sec				
Discharge	ft <sup>3</sup> /sec				

**Notes:**

1. NF - No flow. Water at this location was stagnant.
2. Results containing a less than '<' sign indicate that the parameter was not detected above the laboratory reporting limit. The number that follows the less than sign is the laboratory reporting limit. One
3. Dry - There was no water at this location.
4. Values shown in *italics* were reported by the laboratory with a "J" qualifier. The J qualifier indicates that the analyte was identified below the reporting limit but greater than the limit of

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Quarterly Sampling Locations

Outfall OF 014

Sampling Period		2 <sup>nd</sup> Quarter 2012	3 <sup>rd</sup> Quarter 2012	4 <sup>th</sup> Quarter 2012	1 <sup>st</sup> Quarter 2013
Sampling Date		5/15/12	9/18/12	10/16/12	2/27/13
Analyte	Units	Field Measurements and Laboratory Analyses			
pH					
Temperature	°C				
Conductivity	umhos				
Dissolved oxygen	mg/l				
BOD (5 days)	mg/l				
COD	mg/l				
Propylene Glycol	mg/l				
TPH-DRO	ug/l				
TSS	mg/l				
Total Kjeldahl Nitrogen	mg/l				
Visual Observations					
Color		Clear	Lt. brown	Clear	Clear
Odor		None	None	None	Glycol
Clarity		Clear	Clear	Clear	Clear
Floating solids		Yes	None	None	None
Suspended solids		Yes	None	None	None
Settled solids		None	Yes	None	None
Foam		None	None	None	None
Oil sheen		None	None	None	None
Other		None	None	None	None
Calculated Discharge					
Velocity	ft/sec				
Discharge	ft <sup>3</sup> /sec				

Notes:

1. NF - No flow. Water at this location was stagnant.
2. Results containing a less than '<' sign indicate that the parameter was not detected above the laboratory reporting limit. The number that follows the less than sign is the laboratory reporting limit. One
3. Dry - There was no water at this location.
4. Values shown in *Italics* were reported by the laboratory with a "J" qualifier. The J qualifier indicates that the analyte was identified below the reporting limit but greater than the limit of



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Quarterly Sampling Locations  
Outfall OF 015

Sampling Period		2 <sup>nd</sup> Quarter 2012	3 <sup>rd</sup> Quarter 2012	4 <sup>th</sup> Quarter 2012	1 <sup>st</sup> Quarter 2013
Sampling Date		5/15/12	9/18/12	10/16/12	2/27/13
Analyte	Units	Field Measurements and Laboratory Analyses			
pH		7.40	8.05	7.48	7.15
Temperature	°C	18.4	21.7	16.1	8.0
Conductivity	umhos	104	143	389	447
Dissolved oxygen	mg/l	8.1	5.3	6.8	8.1
BOD (5 days)	mg/l	<4	<4	17	36.3
COD	mg/l	<10	23	53	64.8
Propylene Glycol	mg/l			<5.0	<5.0
TPH-DRO	ug/l	0.16	0.13	0.13	0.22
TSS	mg/l	3.6	3.6	4.5	2.8
Total Kjeldahl Nitrogen	mg/l	<0.5	<0.5	0.7	0.57
Visual Observations					
Color		Clear	Clear	Clear	Lt. brown
Odor		None	None	None	None
Clarity		Clear	Clear	Clear	Clear
Floating solids		Yes	None	None	Yes
Suspended solids		Yes	None	None	None
Settled solids		None	None	None	Yes
Foam		None	None	None	None
Oily sheen		Yes	Yes	None	None
Other		None	None	None	None
Calculated Discharge					
Velocity	ft/sec	0.49	0.68	0.81	0.67
Discharge	ft <sup>3</sup> /sec	8.76	4.93	8.91	7.95

Notes:

1. NF - No flow. Water at this location was stagnant.
2. Results containing a less than '<' sign indicate that the parameter was not detected above the laboratory reporting limit. The number that follows the less than sign is the laboratory reporting limit. One
3. Dry - There was no water at this location.
4. Values shown in *Italics* were reported by the laboratory with a "J" qualifier. The J qualifier indicates that the analyte was identified below the reporting limit but greater than the limit of

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**Quarterly Sampling Locations  
Outfall OF 016**

Sampling Period		2 <sup>nd</sup> Quarter 2012	3 <sup>rd</sup> Quarter 2012	4 <sup>th</sup> Quarter 2012	1 <sup>st</sup> Quarter 2013
Sampling Date		5/15/12	9/18/12	10/16/12	2/27/13
Analyte	Units	Field Measurements and Laboratory Analyses			
pH					
Temperature	°C				
Conductivity	umhos				
Dissolved oxygen	mg/l				
BOD (5 days)	mg/l				
COD	mg/l				
Propylene Glycol	mg/l				
TPH-DRO	ug/l				
TSS	mg/l				
Total Kjeldahl Nitrogen	mg/l				
Visual Observations					
Color		Clear	Lt. brown	Clear	Clear
Odor		None	None	None	None
Clarity		Clear	Clear	Clear	Clear
Floating solids		Yes	None	None	None
Suspended solids		Yes	Yes	None	None
Settled solids		None	Yes	None	None
Foam		None	None	None	None
Oily sheen		Yes	None	None	None
Other		None	None	None	None
Calculated Discharge					
Velocity	ft/sec				
Discharge	ft <sup>3</sup> /sec				

Notes:

1. NF - No flow. Water at this location was stagnant.
2. Results containing a less than '<' sign indicate that the parameter was not detected above the laboratory reporting limit. The number that follows the less than sign is the laboratory reporting limit. One
3. Dry - There was no water at this location.
4. Values shown in *Italics* were reported by the laboratory with a "J" qualifier. The J qualifier indicates that the analyte was identified below the reporting limit but greater than the limit of



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**Annual Sampling Locations**

		<b>OF-017</b>	<b>OF-018</b>
<b>Sampling Period</b>		<b>2011</b>	<b>2011</b>
<b>Sampling Date</b>		<b>5/10/12</b>	<b>5/10/12</b>
<b>Analyte</b>	<b>Units</b>	<b>Field Measurements and Laboratory Analyses</b>	
pH		8.32	6.51
Temperature	°C	15.2	13.8
Conductivity	umhos	91	344
Dissolved oxygen	mg/l	3.1	4.1
BOD (5 days)	mg/l		
COD	mg/l		
Propylene Glycol	mg/l		
TPH (Method 1664)	mg/l		
TPH-DRO	ug/l	0.17	0.12
TSS	mg/l	110	66
Total Kjeldahl Nitrogen	mg/l		
<b>Visual Observations</b>			
Color		Brown	Brown
Odor		None	None
Clarity		Opaque	Opaque
Floating solids		None	Yes
Suspended solids		Yes	Yes
Settled solids		Yes	Yes
Foam		None	None
Oily sheen		None	None
Other		None	None
<b>Calculated Discharge</b>			
Velocity	ft/sec	NF	NF
Discharge	ft <sup>3</sup> /sec	0.00	0.00

**Notes:**

1. NF - No flow. Water at this location was stagnant.
2. Results containing a less than '<' sign indicate that the parameter was not detected above the laboratory reporting limit. The number that follows the less than sign is the laboratory reporting limit. One half of the laboratory reporting limit is used for these results in the statistical analyses.

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**Quarterly Sampling Locations  
Outfall OF 019**

Sampling Period		2 <sup>nd</sup> Quarter 2012	3 <sup>rd</sup> Quarter 2012	4 <sup>th</sup> Quarter 2012	1 <sup>st</sup> Quarter 2013
Sampling Date		5/15/12	9/18/12	10/16/12	2/27/13
Analyte	Units	Field Measurements and Laboratory Analyses			
pH		7.69	7.76	7.76	8.65
Temperature	°C	16.5	19.5	15.2	9.7
Conductivity	umhos	264	331	659	265
Dissolved oxygen	mg/l	7.0	5.0	6.9	8.5
BOD (5 days)	mg/l	<4	<4	<4	<5.9
COD	mg/l	21	17	23	23.9
Propylene Glycol	mg/l			<5.0	<5.0
TPH-DRO	ug/l	0.076	<0.10	<0.10	0.070
TSS	mg/l	5.9	6.6	2.8	5.0
Total Kjeldahl Nitrogen	mg/l	0.7	<0.5	<0.5	0.66
Visual Observations					
Color		Lt. brown	Clear	Clear	Lt. green
Odor		None	None	None	None
Clarity		Clear	Clear	Clear	Clear
Floating solids		None	None	None	Yes
Suspended solids		Yes	None	None	Yes
Settled solids		Yes	None	None	Yes
Foam		None	None	None	Yes
Oily sheen		None	None	None	None
Other		None	None	None	None
Calculated Discharge					
Velocity	ft/sec	1.79	0.45	NF	0.69
Discharge	ft <sup>3</sup> /sec	4.23	0.58	0.00	1.00

**Notes:**

1. NF - No flow. Water at this location was stagnant.
2. Results containing a less than '<' sign indicate that the parameter was not detected above the laboratory reporting limit. The number that follows the less than sign is the laboratory reporting limit. One
3. Dry - There was no water at this location.
4. Values shown in *italics* were reported by the laboratory with a "J" qualifier. The J qualifier indicates that the analyte was identified below the reporting limit but greater than the limit of



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Monthly Sampling Locations  
Outfall OF 020

Sample Period		May	June	July	August	September	October	November	December	January	February	March	April
Sample Date:		5/10/12	6/13/12	7/9/12	8/10/12	9/18/12	10/3/12	11/13/12	12/10/12	1/15/13	2/8/13	3/7/13	4/5/13
Analyte	Units	Field Measurements and Laboratory Analyses											
pH		7.91	8.24	7.82	7.60	7.47	7.80	7.80	7.96	8.32	8.29	7.33	7.86
Temperature	°C	16.5	20.5	24.1	24.3	21.0	21.6	9.8	11.2	7.1	4.30	3.9	8.0
Conductivity	umhos	141	157	156	145	245	152	93	531	155	277	202	185
Dissolved Oxygen	mg/l	7.2	6.2	5.4	5.8	7.2	5.7	8.0	8.8	9.7	11.6	11.2	10.4
BOD (5 days)	mg/l												
COD	mg/l												
Propylene Glycol	mg/l												
TPH-DRO	ug/l	0.048	<0.1	0.21	<0.10	<0.10	<0.10	<0.10	0.040	0.065	0.042	<0.10	<0.10
Total Suspended Solids	mg/l	6	3.3	5.8	1.4	14	<1.0	2.7	7.2	1.6	1.3	1.1	1.6
Total Kjeldahl Nitrogen	mg/l												
Visual Observations													
Color		Clear	Clear	Clear	Clear	Lt.brown	Clear	Lt. brown	Clear	Clear	Clear	Clear	Clear
Odor		None	None	None	None	None	None	None	None	None	None	None	None
Clarity		Clear	Clear	Clear	Clear	Opaque	Clear	Clear	Clear	Clear	Clear	Clear	Clear
Floating solids		None	None	None	None	None	None	None	Yes	Yes	Yes	None	Yes
Suspended solids		None	None	Yes	None	Yes	None	None	Yes	Yes	Yes	None	Yes
Settled solids		Yes	None	Yes	None	Yes	None	Yes	None	Yes	Yes	None	Yes
Foam		None	None	None	None	None	None	None	None	None	None	None	None
Oily sheen		None	None	None	None	None	None	None	None	None	None	None	None
Other		None	None	None	None	None	None	None	None	None	None	None	None
Calculated Discharge													
Velocity	ft/sec	2.74	0.78	0.59	1.62	0.98	1.90	4.23	0.33	0.80	0.74	0.96	0.45
Discharge	ft <sup>3</sup> /sec	4.77	1.36	1.03	2.82	1.71	3.31	9.94	0.167	0.898	0.834	2.25	0.596

Notes:

1. NF - No flow. Water at this location was stagnant.
2. Results containing a less than '<' sign indicate that the parameter was not detected above the laboratory reporting limit. The number that follows the less than sign is the laboratory reporting limit. One half of the laboratory reporting limit is used for these results in the statistical analyses.
3. Values shown in *italics* were reported by the laboratory with a "J" qualifier. The J qualifier indicates that the analyte was identified below the reporting limit but greater than the limit of detection. The value provided is an estimate.
4. Values shown in **Bold** are the results from locations that were resampled. Resampling was required because initial laboratory analysis was resulted in reporting limits that were above the requirements in the VPDES permit.



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Monthly Sampling Locations  
Outfall OF 021

Sample Period		May	June	July	August	September	October	November	December	January	February	March	April
Sample Date:		5/10/12	6/13/12	7/9/12	8/10/12	9/18/12	10/3/12	11/13/12	12/10/12	1/15/13	2/8/13	3/7/13	4/5/13
Analyte	Units	Field Measurements and Laboratory Analyses											
pH		8.24	8.44	8.08	7.79	8.27	8.27	7.85	8.57	8.50	8.56	7.37	7.92
Temperature	°C	14.8	21.0	22.5	23.7	21.9	20.5	9.5	9.1	7.4	7.2	4.2	8.1
Conductivity	umhos	118	125	158	134	108	104	107	199	104	130	206	154
Dissolved Oxygen	mg/l	8.0	6.3	7.4	6.1	6.3	6.7	8.3	10.4	9.2	12.5	10.4	8.7
BOD (5 days)	mg/l												
COD	mg/l												
Propylene Glycol	mg/l												
TPH-DRO	ug/l	0.058	<0.10	0.21	0.080	<0.10	0.073	<0.10	0.047	0.069	0.051	0.042	0.096
Total Suspended Solids	mg/l	1.6	7.4	27	3.0	48	1.5	3.7	82	14	7.5	9.0	3.5
Total Kjeldahl Nitrogen	mg/l												
Visual Observations													
Color		Clear	Clear	Lt. brown	Clear	Lt. brown	Clear	Clear	Brown	Clear	Clear	Clear	Clear
Odor		Fuel	None	None	None	None	None	Glycol	Glycol	None	None	None	None
Clarity		Clear	Clear	Clear	Clear	Opaque	Clear	Clear	Opaque	Clear	Clear	Clear	Clear
Floating solids		None	Yes	None	None	Yes	None	None	Yes	Yes	None	None	None
Suspended solids		None	Yes	None	None	Yes	None	None	Yes	Yes	None	None	None
Settled solids		None	Yes	None	None	Yes	None	None	Yes	Yes	None	None	None
Foam		None	None	None	None	None	None	None	None	None	None	None	None
Oily sheen		None	Yes	None	None	None	None	None	Yes	None	None	None	None
Other		None	None	None	None	None	None	None	None	None	None	None	None
Calculated Discharge													
Velocity	ft/sec	NF	NF	NF	0.43	0.48	0.80	0.88	NF	NF	NF	1.46	NF
Discharge	ft <sup>3</sup> /sec	0.00	0.00	0.00	0.401	0.218	0.826	0.822	0.00	0.00	0.00	1.22	0.00

Notes:

1. NF - No flow. Water at this location was stagnant.
2. Results containing a less than "<" sign indicate that the parameter was not detected above the laboratory reporting limit. The number that follows the less than sign is the laboratory reporting limit. One half of the laboratory reporting limit is used for these results in the statistical analyses.
3. Values shown in *Italics* were reported by the laboratory with a "J" qualifier. The J qualifier indicates that the analyte was identified below the reporting limit but greater than the limit of detection. The value provided is an estimate.
4. Values shown in **Bold** are the results from locations that were resampled. Resampling was required because initial laboratory analysis was resulted in reporting limits that were above the requirements in the VPDES permit.



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**Quarterly Sampling Locations  
Outfall OF 022**

Sampling Period		2 <sup>nd</sup> Quarter 2012	3 <sup>rd</sup> Quarter 2012	4 <sup>th</sup> Quarter 2012	1 <sup>st</sup> Quarter 2013
Sampling Date		5/15/12	9/18/12	10/16/12	2/27/13
Analyte	Units	Field Measurements and Laboratory Analyses			
pH		7.45	8.25	7.91	7.59
Temperature	°C	18.0	20.4	14.7	8.1
Conductivity	umhos	157	184	500	264
Dissolved oxygen	mg/l	6.1	6.4	6.0	8.3
BOD (5 days)	mg/l	57	<4	<4	3.9
COD	mg/l	36	17	13	23.9
Propylene Glycol	mg/l			<5.0	<5.0
TPH-DRO	ug/l	0.080	<0.10	0.097	0.10
TSS	mg/l	6.9	27	4.4	4.5
Total Kjeldahl Nitrogen	mg/l	1.6	<0.5	<0.5	0.69
Visual Observations					
Color		Lt. brown	Clear	Clear	Brown
Odor		None	None	None	None
Clarity		Opaque	Clear	Clear	Clear
Floating solids		None	Yes	None	None
Suspended solids		Yes	Yes	None	Yes
Settled solids		Yes	Yes	None	Yes
Foam		None	None	None	Yes
Oily sheen		None	None	None	None
Other		None	None	None	None
Calculated Discharge					
Velocity	ft/sec	1.03	NF	NF	0.49
Discharge	ft <sup>3</sup> /sec	7.7	0.0	0.00	3.57

**Notes:**

1. NF - No flow. Water at this location was stagnant.
2. Results containing a less than '<' sign indicate that the parameter was not detected above the laboratory reporting limit. The number that follows the less than sign is the laboratory reporting limit. One
3. Dry - There was no water at this location.
4. Values shown in *italics* were reported by the laboratory with a "J" qualifier. The J qualifier indicates that the analyte was identified below the reporting limit but greater than the limit of

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**Quarterly Sampling Locations  
Outfall OF 023**

Sampling Period		2 <sup>nd</sup> Quarter 2012	3 <sup>rd</sup> Quarter 2012	4 <sup>th</sup> Quarter 2012	1 <sup>st</sup> Quarter 2013
Sampling Date		5/15/12	9/18/12	10/16/12	2/27/13
Analyte	Units	Field Measurements and Laboratory Analyses			
pH					
Temperature	°C				
Conductivity	umhos				
Dissolved oxygen	mg/l				
BOD (5 days)	mg/l				
COD	mg/l				
Propylene Glycol	mg/l				
TPH-DRO	ug/l				
TSS	mg/l				
Total Kjeldahl Nitrogen	mg/l				
Visual Observations					
Color		Brown	Lt. brown	Clear	Brown
Odor		None	None	None	None
Clarity		Opaque	Opaque	Clear	Clear
Floating solids		Yes	Yes	None	None
Suspended solids		Yes	Yes	None	Yes
Settled solids		Yes	Yes	None	Yes
Foam		None	None	None	Yes
Oily sheen		None	None	None	None
Other		None	None	None	None
Calculated Discharge					
Velocity	ft/sec				
Discharge	ft <sup>3</sup> /sec				

Notes:

1. NF - No flow. Water at this location was stagnant.
2. Results containing a less than '<' sign indicate that the parameter was not detected above the laboratory reporting limit. The number that follows the less than sign is the laboratory reporting limit. One
3. Dry - There was no water at this location.
4. Values shown in *Italics* were reported by the laboratory with a "J" qualifier. The J qualifier indicates that the analyte was identified below the reporting limit but greater than the limit of



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**Quarterly Sampling Locations**  
**Outfall OF 024**

Sampling Period		2 <sup>nd</sup> Quarter 2012	3 <sup>rd</sup> Quarter 2012	4 <sup>th</sup> Quarter 2012	1 <sup>st</sup> Quarter 2013
Sampling Date		5/15/12	9/18/12	10/16/12	2/27/13
Analyte	Units	Field Measurements and Laboratory Analyses			
pH					
Temperature	°C				
Conductivity	umhos				
Dissolved oxygen	mg/l				
BOD (5 days)	mg/l				
COD	mg/l				
Propylene Glycol	mg/l				
TPH-DRO	ug/l				
TSS	mg/l				
Total Kjeldahl Nitrogen	mg/l				
Visual Observations					
Color		Brown	Lt. brown	Clear	Brown
Odor		None	None	None	None
Clarity		Opaque	Opaque	Clear	Clear
Floating solids		Yes	Yes	None	None
Suspended solids		Yes	Yes	None	Yes
Settled solids		Yes	Yes	None	Yes
Foam		None	None	None	Yes
Oily sheen		None	None	None	None
Other		None	None	None	None
Calculated Discharge					
Velocity	ft/sec				
Discharge	ft <sup>3</sup> /sec				

**Notes:**

1. NF - No flow. Water at this location was stagnant.
2. Results containing a less than '<' sign indicate that the parameter was not detected above the laboratory reporting limit. The number that follows the less than sign is the laboratory reporting limit. One
3. Dry - There was no water at this location.
4. Values shown in *Italics* were reported by the laboratory with a "J" qualifier. The J qualifier indicates that the analyte was identified below the reporting limit but greater than the limit of

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Quarterly Sampling Locations  
Outfall OF 025

Sampling Period		2 <sup>nd</sup> Quarter 2012	3 <sup>rd</sup> Quarter 2012	4 <sup>th</sup> Quarter 2012	1 <sup>st</sup> Quarter 2013
Sampling Date		5/15/12	9/18/12	10/16/12	2/27/13
Analyte	Units	Field Measurements and Laboratory Analyses			
pH		7.47	7.90	7.55	8.77
Temperature	°C	18.1	20.6	13.5	6.7
Conductivity	umhos	198	535	763	261
Dissolved oxygen	mg/l	5.9	5.8	5.0	9.9
BOD (5 days)	mg/l	<4	<4	<4	4
COD	mg/l	28	59	17	39.8
Propylene Glycol	mg/l			<5.0	<5.0
TPH-DRO	ug/l	0.22	0.043	<0.10	0.22
TSS	mg/l	8.8	24	2	9.1
Total Kjeldahl Nitrogen	mg/l	1.1	<0.5	0.6	0.92
Visual Observations					
Color		Lt. brown	Clear	Clear	Brown
Odor		None	None	None	None
Clarity		Clear	Clear	Clear	Opaque
Floating solids		None	None	None	None
Suspended solids		None	None	None	Yes
Settled solids		Yes	Yes	None	Yes
Foam		None	Yes	Yes	None
Oily sheen		None	None	None	None
Other		None	None	None	None
Calculated Discharge					
Velocity	ft/sec	1.41	0.730	0.470	2.50
Discharge	ft <sup>3</sup> /sec	2.45	0.826	0.290	1.56

Notes:

1. NF - No flow. Water at this location was stagnant.
2. Results containing a less than '<' sign indicate that the parameter was not detected above the laboratory reporting limit. The number that follows the less than sign is the laboratory reporting limit. One
3. Dry - There was no water at this location.
4. Values shown in *italics* were reported by the laboratory with a "J" qualifier. The J qualifier indicates that the analyte was identified below the reporting limit but greater than the limit of



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Quarterly Sampling Locations  
Outfall OF 026

Sampling Period		2 <sup>nd</sup> Quarter 2012	3 <sup>rd</sup> Quarter 2012	4 <sup>th</sup> Quarter 2012	1 <sup>st</sup> Quarter 2013
Sampling Date		5/15/12	9/18/12	10/16/12	2/27/13
Analyte	Units	Field Measurements and Laboratory Analyses			
pH		7.35	7.67	7.41	7.61
Temperature	°C	18.4	20.5	12.6	5.5
Conductivity	umhos	107	420	477	254
Dissolved oxygen	mg/l	6.5	4.6	4.8	9.5
BOD (5 days)	mg/l	18	<4	21	19.9
COD	mg/l	51	30	42	60.3
Propylene Glycol	mg/l			<5.0	6.6
TPH-DRO	ug/l	0.093	0.045	0.091	0.13
TSS	mg/l	8.4	27	18	9.7
Total Kjeldahl Nitrogen	mg/l	1.2	<0.5	1.0	0.89
Visual Observations					
Color		Brown	Brown	Lt. green	Brown
Odor		None	None	None	None
Clarity		Opaque	Opaque	Opaque	Opaque
Floating solids		None	Yes	Yes	None
Suspended solids		Yes	Yes	Yes	Yes
Settled solids		Yes	Yes	Yes	Yes
Foam		None	None	None	None
Oily sheen		None	None	Yes	None
Other		None	None	None	None
Calculated Discharge					
Velocity	ft/sec	NF	0.64	NF	NF
Discharge	ft <sup>3</sup> /sec	0.00	5.38	0.00	0.00

Notes:

1. NF - No flow. Water at this location was stagnant.
2. Results containing a less than '<' sign indicate that the parameter was not detected above the laboratory reporting limit. The number that follows the less than sign is the laboratory reporting limit. One
3. Dry - There was no water at this location.
4. Values shown in *italics* were reported by the laboratory with a "J" qualifier. The J qualifier indicates that the analyte was identified below the reporting limit but greater than the limit of

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**Quarterly Sampling Locations  
Outfall OF 027**

Sampling Period		2 <sup>nd</sup> Quarter 2012	3 <sup>rd</sup> Quarter 2012	4 <sup>th</sup> Quarter 2012	1 <sup>st</sup> Quarter 2013
Sampling Date		5/15/12	9/18/12	10/16/12	2/27/13
Analyte	Units	Field Measurements and Laboratory Analyses			
pH		7.32	7.79	7.43	7.80
Temperature	"C	17.3	18.6	12.3	5.8
Conductivity	umhos	157	554	768	185
Dissolved oxygen	mg/l	6.5	3.5	6.4	9.5
BOD (5 days)	mg/l	11	<4	22	10.4
COD	mg/l	38	21	17	48.9
Propylene Glycol	mg/l			<5.0	<5.0
TPH-DRO	ug/l	0.12	<0.10	<0.10	0.30
TSS	mg/l	21	3.3	2.9	14
Total Kjeldahl Nitrogen	mg/l	0.8	<0.5	<0.5	0.98
Visual Observations					
Color		Brown	Clear	Clear	Brown
Odor		None	None	None	None
Clarity		Opaque	Clear	Clear	Opaque
Floating solids		None	None	None	None
Suspended solids		Yes	None	None	Yes
Settled solids		Yes	Yes	None	Yes
Foam		None	None	None	Yes
Oily sheen		None	None	None	None
Other		None	None	None	None
Calculated Discharge					
Velocity	ft/sec	4.48	0.72	0.72	1.46
Discharge	ft <sup>3</sup> /sec	10.9	1.76	1.75	3.54

**Notes:**

1. NF - No flow. Water at this location was stagnant.
2. Results containing a less than '<' sign indicate that the parameter was not detected above the laboratory reporting limit. The number that follows the less than sign is the laboratory reporting limit. One
3. Dry - There was no water at this location.
4. Values shown in *italics* were reported by the laboratory with a "J" qualifier. The J qualifier indicates that the analyte was identified below the reporting limit but greater than the limit of



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**Quarterly Sampling Locations  
Outfall OF 028**

Sampling Period		2 <sup>nd</sup> Quarter 2012	3 <sup>rd</sup> Quarter 2012	4 <sup>th</sup> Quarter 2012	1 <sup>st</sup> Quarter 2013
Sampling Date		5/15/12	9/18/12	10/16/12	2/27/13
Analyte	Units	Field Measurements and Laboratory Analyses			
pH					
Temperature	°C				
Conductivity	umhos				
Dissolved oxygen	mg/l				
BOD (5 days)	mg/l				
COD	mg/l				
Propylene Glycol	mg/l				
TPH-DRO	ug/l				
TSS	mg/l				
Total Kjeldahl Nitrogen	mg/l				
Visual Observations					
Color		Lt. brown	Lt. green	Clear	Lt. brown
Odor		None	None	None	None
Clarity		Opaque	Clear	Clear	Opaque
Floating solids		None	None	None	None
Suspended solids		Yes	None	None	Yes
Settled solids		Yes	None	None	Yes
Foam		None	None	None	Yes
Oily sheen		None	None	None	None
Other		None	None	None	None
Calculated Discharge					
Velocity	ft/sec				
Discharge	ft <sup>3</sup> /sec				

**Notes:**

1. NF - No flow. Water at this location was stagnant.
2. Results containing a less than '<' sign indicate that the parameter was not detected above the laboratory reporting limit. The number that follows the less than sign is the laboratory reporting limit. One
3. Dry - There was no water at this location.
4. Values shown in *italics* were reported by the laboratory with a "J" qualifier. The J qualifier indicates that the analyte was identified below the reporting limit but greater than the limit of

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**Quarterly Sampling Locations  
Outfall OF 029**

Sampling Period		2 <sup>nd</sup> Quarter 2012	3 <sup>rd</sup> Quarter 2012	4 <sup>th</sup> Quarter 2012	1 <sup>st</sup> Quarter 2013
Sampling Date		5/15/12	9/18/12	10/16/12	2/27/13
Analyte	Units	Field Measurements and Laboratory Analyses			
pH					
Temperature	°C				
Conductivity	umhos				
Dissolved oxygen	mg/l				
BOD (5 days)	mg/l				
COD	mg/l				
Propylene Glycol	mg/l				
TPH-DRO	ug/l				
TSS	mg/l				
Total Kjeldahl Nitrogen	mg/l				
Visual Observations					
Color		Lt. brown	Lt. brown	Lt. brown	Clear
Odor		None	None	None	None
Clarity		Opaque	Clear	Opaque	Clear
Floating solids		None	None	None	None
Suspended solids		Yes	Yes	Yes	Yes
Settled solids		Yes	Yes	Yes	Yes
Foam		None	None	None	Yes
Oily sheen		None	None	None	None
Other		None	None	None	None
Calculated Discharge					
Velocity	ft/sec				
Discharge	ft <sup>3</sup> /sec				

**Notes:**

1. NF - No flow. Water at this location was stagnant.
2. Results containing a less than '<' sign indicate that the parameter
3. Dry - There was no water at this location.
4. Values shown in *Italics* were reported by the laboratory with a "J" qualifier. The J qualifier indicates that the analyte was identified below the reporting limit but greater than the limit of



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Monthly Sampling Locations  
Outfall OF 030

Sample Period	May	June	July	August	September	October	November	December	January	February	March	April	
Sample Date:	5/10/12	6/13/12	7/9/12	8/10/12	9/18/12	10/3/12	11/13/12	12/10/12	1/15/13	2/8/13	3/7/13	4/5/13	
Analyte	Units	Field Measurements and Laboratory Analyses											
pH		7.76	8.08	7.64	7.77	8.26	8.41	8.26	8.82	8.14	8.50	8.37	7.81
Temperature	°C	15.1	20.7	24.7	23.4	20.8	18.9	9.2	7.0	6.0	3.6	2.0	6.6
Conductivity	umhos	252	280	239	126	221	245	193	371	160	474	347	366
Dissolved Oxygen	mg/l	4.3	3.8	3.4	9.5	4.3	4.5	7.2	8.8	8.5	10.5	11.0	7.9
BOD (5 days)	mg/l												
COD	mg/l												
Propylene Glycol	mg/l												
TPH-DRO	ug/l	0.11	0.065	0.18	0.060	0.079	0.059	0.042	0.051	0.084	0.064	0.072	0.12
Total Suspended Solids	mg/l	3.8	4.6	7.4	13	9.1	8.2	18	2.7	9.8	5.5	11	3.8
Total Kjeldahl Nitrogen	mg/l												
Visual Observations													
Color	Lt. green	Clear	Clear	Lt. brown	Lt. green	Lt. brown	Lt. brown	Clear	Brown	Lt. green	Lt. brown	Lt. green	
Odor	None	None	None	None	None	None	None	None	None	None	None	None	
Clarity	Clear	Clear	Clear	Clear	Clear	Opaque	Opaque	Clear	Opaque	Opaque	Opaque	Clear	
Floating solids	None	None	None	None	Yes	Yes	None	None	Yes	None	None	None	
Suspended solids	None	None	None	Yes	None	Yes	Yes	None	Yes	Yes	Yes	None	
Settled solids	Yes	None	None	Yes	Yes	Yes	None	None	None	Yes	Yes	None	
Foam	None	None	None	None	None	None	None	None	None	None	None	None	
Oily sheen	None	None	None	None	None	None	None	None	None	None	None	None	
Other	None	None	None	None	None	None	None	None	None	None	None	None	
Calculated Discharge													
Velocity	ft/sec	0.68	0.56	0.90	1.55	NF	0.83	1.96	NF	0.25	0.33	1.43	0.36
Discharge	ft <sup>3</sup> /sec	2.62	2.13	2.69	18.5	0.00	5.62	21.6	0.00	3.11	1.72	6.76	1.38

Notes:

1. NF - No flow. Water at this location was stagnant.
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3. Values shown in *Italics* were reported by the laboratory with a "J" qualifier. The J qualifier indicates that the analyte was identified below the reporting limit but greater than the limit of detection. The value provided is an estimate.
4. Values shown in **Bold** are the results from locations that were resampled. Resampling was required because initial laboratory analysis was resulted in reporting limits that were above the requirements in the VPDES permit.



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Monthly Sampling Locations  
Outfall OF 031

Sample Period		May	June	July	August	September	October	November	December	January	February	March	April
Sample Date:		5/10/12	6/13/12	7/9/12	8/10/12	9/18/12	10/3/12	11/13/12	12/10/12	1/15/13	2/8/13	3/7/13	4/5/13
Analyte	Units	Field Measurements and Laboratory Analyses											
pH		7.73	8.32	7.48	7.74	7.63	8.50	9.30	7.78	8.70	8.66	8.52	7.24
Temperature	°C	15.1	19.5	22.6	23.4	20.6	20.0	11.5	13.0	10.8	8.0	9.0	9.3
Conductivity	umhos	333	319	322	149	357	391	197	469	448	483	493	342
Dissolved Oxygen	mg/l	2.3	2.1	4.0	4.6	3.4	1.9	7.6	3.8	6.6	7.7	6.1	7.7
BOD (5 days)	mg/l	11	<4	<10	6	<4	41	22	<4	565	456	93.4	489
COD	mg/l	21	11	19	25	15	19	36	15	956	1,990	208	804
Propylene Glycol	mg/l						<5.0	6.4	<5.0	130	1,200	27	130
TPH-DRO	ug/l	0.15	0.095	0.17	0.074	<0.10	0.057	<0.10	0.059	0.23	0.095	0.12	0.20
Total Suspended Solids	mg/l	4.1	2.0	3.9	2.4	9.0	3.5	2.3	3.5	4.6	5.7	7.6	2.8
Total Kjeldahl Nitrogen	mg/l	0.7	<0.5	0.6	0.7	<0.5	0.7	<0.5	<0.5	0.5	<0.5	<0.5	<0.5
Visual Observations													
Color		Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
Odor		None	None	None	None	None	None	None	None	None	None	None	None
Clarity		Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
Floating solids		None	None	None	None	None	None	Yes	None	None	None	None	None
Suspended solids		None	None	None	None	None	None	None	None	None	None	None	None
Settled solids		None	None	None	None	None	None	None	None	None	None	None	None
Foam		None	None	None	None	None	None	None	None	None	None	None	None
Oily sheen		None	None	None	Yes	None	None	Yes	None	None	None	None	None
Other		None	None	None	None	None	None	None	None	None	None	None	None
Calculated Discharge													
Velocity	ft/sec	NF	NF	NF	0.45	NF	0.47	0.80	NF	0.20	0.38	0.67	0.29
Discharge	ft <sup>3</sup> /sec	0.00	0.00	0.00	1.77	0.00	0.66	4.14	0.00	0.197	0.380	1.23	0.471

Notes:

1. NF - No flow. Water at this location was stagnant.
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3. Values shown in *Italics* were reported by the laboratory with a "J" qualifier. The J qualifier indicates that the analyte was identified below the reporting limit but greater than the limit of detection. The value provided is an estimate.
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Monthly Sampling Locations

Outfall OF 032

Sample Period		May	June	July	August	September	October	November	December	January	February	March	April
Sample Date:		5/10/12	6/13/12	7/9/12	8/10/12	9/18/12	10/3/12	11/13/12	12/10/12	1/15/13	2/8/13	3/7/13	4/5/13
Analyte	Units	Field Measurements and Laboratory Analyses											
pH		8.17	8.89	7.90	7.91	8.09	9.88	11.47	8.30	10.10	9.08	11.05	10.46
Temperature	°C	16.6	22.4	25.4	23.8	20.4	19.8	10.6	11.2	8.3	6.3	5.1	8.4
Conductivity	umhos	102	87	96	96	249	154	252	133	220	208	605	190
Dissolved Oxygen	mg/l	6.5	5.3	6.7	6.2	4.7	6.3	8.8	7.9	9.3	10.7	10.3	9.5
BOD (5 days)	mg/l												
COD	mg/l												
Propylene Glycol	mg/l												
TPH-DRO	ug/l	0.29	0.16	0.21	0.13	0.084	0.18	0.054	0.33	0.25	0.11	0.30	0.39
Total Suspended Solids	mg/l	7.6	5.1	3.3	5.8	10	13	4.3	3.1	3.5	7.2	16	2.8
Total Kjeldahl Nitrogen	mg/l												
Visual Observations													
Color		Clear	Clear	Clear	Clear	Clear	Clear	Lt. green	Clear	Clear	Clear	Clear	Clear
Odor		None	None	None	None	None	None	None	None	None	None	None	None
Clarity		Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
Floating solids		None	None	None	None	None	None	None	None	None	None	None	None
Suspended solids		None	None	None	None	None	None	None	None	None	None	None	None
Settled solids		None	None	None	None	None	None	None	None	None	None	None	None
Foam		None	None	None	None	None	None	None	None	None	None	None	None
Oily sheen		None	Yes	None	None	None	None	Yes	None	None	None	Yes	None
Other		None	None	None	None	None	None	None	None	None	None	None	None
Calculated Discharge													
Velocity	ft/sec	NF	NF	NF	NF	NF	NF	0.39	NF	0.83	NF	NF	NF
Discharge	ft <sup>3</sup> /sec	0.00	0.00	0.00	0.00	0.00	0.00	3.23	0.00	1.25	0.00	0.00	0.00

Notes:

1. NF - No flow. Water at this location was stagnant.
2. Results containing a less than '<' sign indicate that the parameter was not detected above the laboratory reporting limit. The number that follows the less than sign is the laboratory reporting limit. One half of the laboratory reporting limit is used for these results in the statistical analyses.
3. Values shown in *italics* were reported by the laboratory with a "J" qualifier. The J qualifier indicates that the analyte was identified below the reporting limit but greater than the limit of detection. The value provided is an estimate.
4. Values shown in **Bold** are the results from locations that were resampled. Resampling was required because initial laboratory analysis was resulted in reporting limits that were above the requirements in the VPDES permit.



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Monthly Sampling Locations  
Stream Sample SS 001

Sample Period		May	June	July	August	September	October	November	December	January	February	March	April
Sample Date:		5/10/12	6/13/12	7/9/12	8/10/12	9/18/12	10/3/12	11/13/12	12/10/12	1/15/13	2/8/13	3/7/13	4/5/13
Analyte	Units	Field Measurements and Laboratory Analyses											
pH		5.93	6.79	7.63	6.99	8.64	7.20	7.67	7.05	7.80	6.99	7.03	8.28
Temperature	°C	18.0	22.9	29.1	26.1	20.9	19.1	10.7	13.0	2.1	4.3	2.4	9.1
Conductivity	umhos	554	454	412	369		306	450	561	733	715	1155	910
Dissolved Oxygen	mg/l	7.0	6.8	6.5	6.0	6.4	5.9	8.3	8.4	10.9	10.2	11.0	9.2
BOD (5 days)	mg/l	6	<4	<10	<4	<4	<4	<4	<4	<2.0	4	30.5	10.6
COD	mg/l	25	25	28	40	23	36	17	21	<15	26.2	72	27.5
Propylene Glycol	mg/l						<5.0	<5.0	<5.0	<5.0	<5.0	8.9	9.7
TPH-DRO	ug/l	0.096	<0.10	0.22	0.044	<0.10	0.053	<0.10	0.044	0.055	0.051	0.048	<0.10
Total Suspended Solids	mg/l	12	19	8.3	10	16	15	20	9.0	12	8.5	16	3.7
Total Kjeldahl Nitrogen	mg/l	1.1	0.8	0.6	1.6	<0.5	0.9	<0.5	<0.5	0.9	1.2	0.55	0.68
Visual Observations													
Color		Lt. brown	Lt. brown	Lt. brown	Lt. brown	Lt. brown	Lt. brown	Lt. brown	Lt. brown	Lt. brown	Lt. brown	Brown	Lt. brown
Odor		None	None	None	None	None	None	None	None	None	None	None	None
Clarity		Opaque	Opaque	Opaque	Opaque	Opaque	Opaque	Opaque	Opaque	Clear	Clear	Opaque	Clear
Floating solids		None	None	None	None	None	Yes	None	None	None	None	None	Yes
Suspended solids		None	Yes	None	Yes	Yes	Yes	Yes	Yes	Yes	None	Yes	None
Settled solids		None	Yes	None	Yes	Yes	Yes	Yes	Yes	None	None	Yes	None
Foam		None	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Oily sheen		None	None	None	None	None	None	None	None	None	None	None	None
Other		None	None	None	None	None	None	None	None	None	None	None	None
Calculated Discharge													
Velocity	ft/sec	1.68	0.80	0.74	1.32	0.48	1.44	3.21	0.64	2.21	0.88	4.88	0.86
Discharge	ft <sup>3</sup> /sec	96.8	41.3	37.1	74.5	4.5	84.6	204	32.5	117	47.8	299	47.5

Notes:

1. NF - No flow. Water at this location was stagnant.
2. Results containing a less than '<' sign indicate that the parameter was not detected above the laboratory reporting limit. The number that follows the less than sign is the laboratory reporting limit. One half of the laboratory reporting limit is used for these results in the statistical analyses.
3. Values shown in *italics* were reported by the laboratory with a "J" qualifier. The J qualifier indicates that the analyte was identified below the reporting limit but greater than the limit of detection. The value provided is an estimate.
4. Values shown in **Bold** are the results from locations that were resampled. Resampling was required because initial laboratory analysis was resulted in reporting limits that were above the requirements in the VPDES permit.



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Monthly Sampling Locations  
Stream Sample SS 002

Sample Period		May	June	July	August	September	October	November	December	January	February	March	April
Sample Date:		5/10/12	6/13/12	7/9/12	8/10/12	9/18/12	10/3/12	11/13/12	12/10/12	1/15/13	2/8/13	3/7/13	4/5/13
Analyte	Units	Field Measurements and Laboratory Analyses											
pH		7.74	8.05	7.56	7.68	8.07	8.27	7.88	7.86	8.30	8.42	8.38	7.86
Temperature	°C	15.6	21.2	25.7	23.5	19.3	18.6	9.0	9.7	6.8	2.8	1.6	6.4
Conductivity	umhos	310	308	416	141	397	180	227	514	460	367	208	573
Dissolved Oxygen	mg/l	4.7	4.9	6.3	6.4	4.7	5.9	8.2	7.2	8.4	10.7	11.1	11.2
BOD (5 days)	mg/l	<4	<4	<10	5	<4	<4	<4	<4	103	9.5	18.2	108
COD	mg/l	21	11	25	38	21	28	38	17	114	51.2	60.3	139
Propylene Glycol	mg/l						<5.0	<5.0	<5.0	5.9	<5.0	7.9	19
TPH-DRO	ug/l	0.13	0.055	0.065	0.098	<0.10	0.081	<0.10	<0.10	0.098	0.053	0.066	0.072
Total Suspended Solids	mg/l	4.9	5.3	8.8	39	11	6.4	43	2.1	33	8.3	17	22.0
Total Kjeldahl Nitrogen	mg/l	1.3	<0.5	<0.5	<0.5	<0.5	0.8	0.8	<0.5	0.7	<0.5	<0.5	0.56
Visual Observations													
Color		Clear	Clear	Lt. brown	Brown	Lt. brown	Lt. brown	Lt. brown	Clear	Brown	Lt. green	Brown	Lt.brown
Odor		None	None	None	None	None	None	None	None	None	None	None	None
Clarity		Clear	Clear	Clear	Opaque	Opaque	Opaque	Opaque	Clear	Opaque	Clear	Opaque	Clear
Floating solids		None	None	None	None	Yes	Yes	None	Yes	Yes	None	None	None
Suspended solids		None	None	None	Yes	Yes	Yes	Yes	Yes	Yes	None	Yes	None
Settled solids		None	None	None	Yes	Yes	Yes	None	Yes	Yes	Yes	Yes	Yes
Foam		None	None	None	None	None	None	Yes	None	None	Yes	Yes	Yes
Oily sheen		None	None	None	None	None	None	None	None	None	None	None	None
Other		None	None	None	None	None	None	None	None	None	None	None	None
Calculated Discharge													
Velocity	ft/sec	2.37	2.52	1.69	2.94	2.37	1.92	2.22	0.97	1.86	5.08	6.59	3.33
Discharge	ft <sup>3</sup> /sec	4.74	5.04	3.37	10.7	4.74	10.7	41.6	1.93	5.19	14.2	67.3	6.67

Notes:

1. NF - No flow. Water at this location was stagnant.
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Monthly Sampling Locations

Stream Sample SS 003

Sample Period		May	June	July	August	September	October	November	December	January	February	March	April
Sample Date:		5/10/12	6/13/12	7/9/12	8/10/12	9/18/12	10/3/12	11/13/12	12/10/12	1/15/13	2/8/13	3/7/13	4/5/13
Analyte	Units	Field Measurements and Laboratory Analyses											
pH		8.23	8.50	7.63	8.05	7.99	8.50	8.31	7.71	6.71	8.06	8.70	7.85
Temperature	°C	15.9	21.1	24.6	22.9	20.7	19.6	10.0	10.6	2.5	3.1	3.3	6.8
Conductivity	umhos	208	215	260	56	338	326	93	295	641	1,351	1002	519
Dissolved Oxygen	mg/l	5.2	3.1	5.5	5.1	4.1	3.3	7.9	6.7	11.1	7.4	6.4	6.0
BOD (5 days)	mg/l	<4	<4	<10	<4	<4	59	<4	11	4.9	80.7	165	17.1
COD	mg/l	23	17	42	21	30	21	15	28	29	181	190	36.7
Propylene Glycol	mg/l						<5.0	<5.0	<5.0	<5.0	43	25	<5.0
TPH-DRO	ug/l	0.15	0.091	0.2	0.086	<0.10	0.074	<0.10	0.085	0.13	0.082	0.059	0.31
Total Suspended Solids	mg/l	6.7	7.7	4.6	5.1	7.3	3.4	5.2	5.9	6.5	9.2	5.2	2.8
Total Kjeldahl Nitrogen	mg/l	3.1	0.7	<0.5	0.9	<0.5	0.7	<0.5	<0.5	0.7	42.7	4.3	1.7
Visual Observations													
Color		Lt green	Clear	Lt. green	Clear	Lt. brown	Lt. green	Clear	Lt. brown	Lt. brown	Lt. brown	Clear	Clear
Odor		Fuel	None	None	None	None	None	None	None	None	None	None	None
Clarity		Clear	Clear	Clear	Clear	Opaque	Clear	Clear	Clear	Clear	Opaque	Clear	Clear
Floating solids		None	None	None	None	Yes	None	None	None	None	Yes	None	None
Suspended solids		None	None	None	None	None	None	None	None	None	Yes	None	None
Settled solids		Yes	None	Yes	None	None	None	None	None	None	Yes	None	None
Foam		None	None	None	None	Yes	None	None	None	None	None	None	None
Oily sheen		None	None	None	None	Yes	None	None	None	None	None	None	None
Other		None	None	None	None	None	None	None	None	None	None	None	None
Calculated Discharge													
Velocity	ft/sec	NF	NF	NF	0.38	0.96	NF	0.50	NF	NF	NF	NF	NF
Discharge	ft <sup>3</sup> /sec	0.00	0.00	0.00	12.8	23.8	0.00	23.0	0.00	0.00	0.00	0.00	0.00

Notes:

1. NF - No flow. Water at this location was stagnant.
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